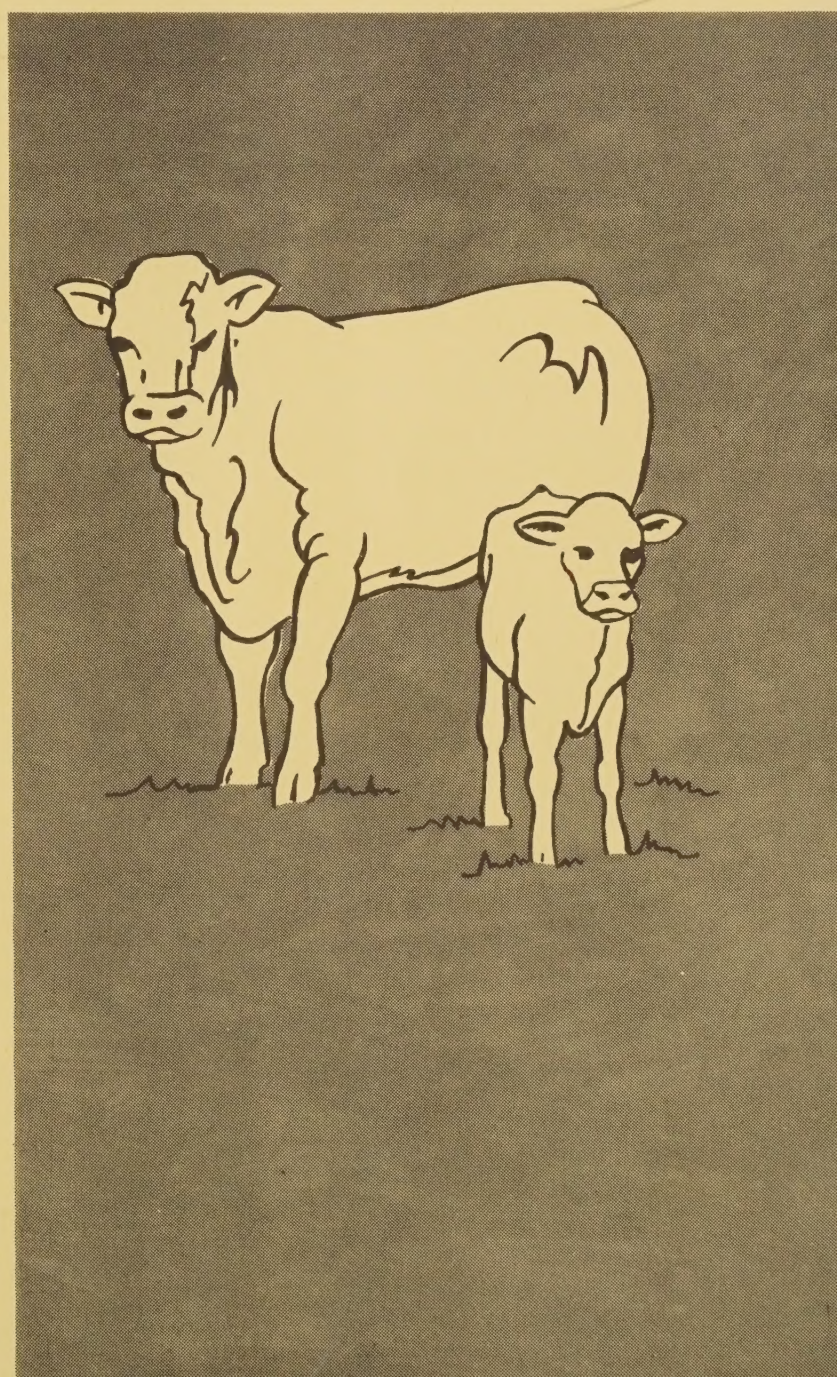
U.S. Department of Agriculture
Science and Education Administration

NATIONAL EXTENSION-INDUSTRY INVITATIONAL WORKSHOP ON BEEF CATTLE REPRODUCTIVE MANAGEMENT

Oct. 30-Nov. 1, 1978



(For Administrative Use)

CONTENTS

PAGE

NATIONAL EXTENSION-INDUSTRY INVITATIONAL WORKSHOP ON BEEF CATTLE REPRODUCTIVE MANAGEMENT

FOREWORD

A National Extension-Industry Beef Resource Committee was established in 1976 by the Subcommittee on Agriculture, Forestry, and Related Industries of Extension Committee on Organization and Policy (ECOP). The purpose of the committee is to identify problems and opportunities which are multi-State or national in scope and recommend the development of educational materials and programs to aid in solving these problems and capitalizing on opportunities. Reproductive management has been a priority concern of this committee since its origin. The National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management was initiated in response to this priority concern.

Invitees were suggested by one or more of the following participating organizations or industries:

National Cattlemen's Association
National Association of Animal Breeders
Beef Improvement Federation
U.S. Beef Breeds Federation
American Association of Bovine Practitioners
Feed Industry
Pharmaceutical Industry
Research
Extension

ooOoo

NATIONAL EXTENSION-INDUSTRY INVITATIONAL WORKSHOP ON
BEEF CATTLE REPRODUCTIVE MANAGEMENT
October 30-November 1, 1978
Oklahoma City, Oklahoma

Monday, October 30, 1978 SESSION I DEFINING THE PROBLEM
A. L. Eller, Jr., VPI&SU, Moderator

9:00 am - 12:00 noon	REGISTRATION
1:00 pm	Welcome - William F. Taggart, Assoc Director of Extension, OSU, Stillwater, OK
1:15 pm	Opening Remarks - A. L. Eller, Jr., VPI&SU, Blacksburg, VA
1:30 pm	Keynote to Set the Stage - Dave Nichols, Merrill Nichols & Son, Anita, IA
2:00 pm	Nutrition - Larry Corah, Kansas State Univ, Manhattan, KS
2:45 pm	Replacement Heifer Management - Robert Bellows, Research Station, Miles City, MT
3:30 pm	BREAK
4:00 pm	Bull Management - P. J. Chenoweth, Texas A&M Univ, College Station, TX
4:30 pm	Herd Health - Tom Bibb, D.V.M., VPI&SU, Blacksburg, VA
5:00 pm	Genetic Selection and Breeding Plans - Ray Woodward, Research Station, Miles City, MT
5:30 pm	Information Cafeteria* and Attitude Adjustment
7:30 pm	Orientation for Workshop Chairmen and Secretaries

*Information Cafeteria--Space provided for participants to exhibit, distribute, and discuss their programs and materials.

Tuesday Morning, October 31, 1978 SESSION II SHOW AND TELL
Robert Totusek, OSU, Moderator

8:00	Estrous Synchronization and Artificial Insemination - Clif Marshall, Select Sires, Inc., Plain City, OH
8:45-9:30	PANEL --
8:45	The Upjohn Approach to Market Lutalyse - James Sokolowski, The Upjohn Co., Kalamazoo, MI
9:00	The Curtiss Approach to Market Syncro-Mate-B - Ron Long, Curtiss Breeding Service, Cary, IL
9:15	The ICI Americas Approach to Market Estrumate - Dennis Copeland, ICI Americas, Inc., Wilmington, DE
9:30	Discussion
10:00	BREAK
10:30	ABS Beef Herd Management System - Tom Price, American Breeders Service, DeForest, WI
11:00	Feed Industry Role in Reproductive Management - Ray Hinders, Producers Grain Corp., Amarillo, TX
11:30	Herd Reproduction Records - Dale Engler, Ramsey Ranch, Eldorado, KS
12:00 noon	LUNCH

Tuesday Afternoon, October 31, 1978 SESSION II SHOW AND TELL
Dixon Hubbard, USDA, SEA-Extension, Moderator

1:15	Texas Extension Program - John Beverly, Texas A&M Univ, College Station, TX
2:15	Idaho Extension Program - J. D. Mankin, Univ of Idaho, Caldwell, ID

Tuesday Afternoon, October 31, 1978 SESSION II SHOW AND TELL
--Continued-- Dixon Hubbard, Moderator

2:45 Highlights of Kentucky and Other State Extension Programs - Ron Parker, Univ of Kentucky, Princeton, KY

3:15 BREAK

3:45 Workshops - Formulating Educational Programs and Recommendations

Participants divided into Work Groups. Based on the input information presented at the Workshop and their prior knowledge of beef cattle reproductive management, the Work Groups will be asked to form recommendations, including methods and materials to be used for more effective and efficient Extension-industry reproductive management programs. The format for the summary reports is as follows:

a. *Statement of problem or opportunity.*
b. *State the objective or reason for emphasis relative to the problem or opportunity identified.*
c. *Give appropriate procedures or methods to be used in solving the problem or capitalizing on the opportunity identified.*
d. *What educational materials would be needed?*
e. *What disciplines and industries need to be involved?*
f. *What results should be expected in five years if this recommendation is properly implemented?*

5:30 DINNER

7:00 Workshops - Continued

Wednesday, November 1, 1978 SESSION III RECOMMENDED EXTENSION-INDUSTRY PROGRAMS AND ACTIVITIES TO IMPROVE REPRODUCTIVE MANAGEMENT
Bill Durfey, NAAB, Moderator

8:30 am	Workshop Reports and Discussions
10:00 am	BREAK
10:30 am	Setting Priorities for Educational Programs - Bill Durfey, Natl. Assn. of Animal Breeders, Columbia, MO
11:30 am	Respond to the Challenge - O. D. Butler, Vice President for Ag & Renewable Resources, Texas A&M Univ, College Station, TX
12:00 noon	ADJOURN

ooOoo

WELCOME

We want each of you to personally and sincerely feel welcome whether it's your first or a repeat visit to the great State of Oklahoma.

In Oklahoma, we are an agricultural State. Agriculture is our number one industry, just ahead of petroleum, as far as economic impact upon the State is concerned. Our major ag income is from beef, with wheat, alfalfa, and grass as our major crops. Our State's topography varies from over 4,000 feet and an 18" rainfall belt in the High Plains Panhandle area to over 50" and just over 400 feet elevation at Idabel in Southeast Oklahoma. Our topography varies from almost treeless plains in Northwest Oklahoma to tall timbered areas in Southeast Oklahoma. At Vallient, Oklahoma, one of the largest paper mills in the U.S. is owned by Weyerhauser Corporation.

In Oklahoma, we mainly are a dryland crop producing region but irrigate corn, cotton, milo, peanuts, and several special crops in the Panhandle and in Southwest Oklahoma.

Our greatest asset in our State is our people. They are of hardy, rough pioneer stock; many whose immediate ancestors homesteaded Indian territory and in Western Oklahoma ahead of Statehood in 1907. There are also many with Indian heritage whose ancestors either moved here as one of the five civilized tribes or who have heritage in the Western or Plains Indian cultures that hunted in that part of the world for many centuries.

We are here today and in this conference to address a most important problem and to share and pool our knowledge on a very important area "Beef Cattle Reproductive Management."

To be assured of an abundance of food of good quality, we must as a Nation increase our knowledge. We are blessed with a rich land. We must guard it well, conserving and improving it by means of the most up-to-date knowledge and techniques. We are blessed with intelligent, informed, and an industrious people who put the results of agricultural research to work in highly effective ways. Research--agricultural research, food research--must go forward. We must learn to produce evermore efficiently, to process and to package, to meet increasing demands to market evermore effectively, and to use our abundance evermore wisely.

Presented by William F. Taggart, Associate Director of Extension Service, Oklahoma State University, Stillwater, OK, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

To accompany research, there must always be more and more education. Facts must be made available widely to get full use. This is one of the purposes of this conference.

So, as we begin this conference, let us truly recognize that ours is a choice land and that ours is a great opportunity to work in it. We are fortunate to be here together to share, to listen, and to learn. We should ever be grateful to the Almighty for our many blessings and opportunities. Let us ever be devoted to the spiritual and moral principles upon which all lasting progress must inevitably rest.

ooOoo

OPENING REMARKS

You have been officially welcomed by William Taggart, Associate Director of Cooperative Extension Service, Oklahoma State University and Administrative Advisor to the National Extension-Industry Beef Resource Committee. We appreciate the opportunity to hold this conference in the State of Oklahoma. On behalf of the Planning Committee composed of Dixon Hubbard, Animal Scientist (Extension), USDA; Bill Durfey, Executive Secretary, National Association of Animal Breeders; John Beverly, Extension Specialist, Texas A&M; Don Hutzel, Northern Ohio Breeders Association; Roy Wallace, Select Sires, Inc.; Ken Young, American Breeders Service; Curtis Absher, Extension Specialist, University of Kentucky; and myself, I want to take this opportunity to also welcome you to this very important beef cattle conference.

This workshop has been planned because reproductive management has been a priority concern of the National Extension-Industry Beef Resource Committee since its origin in 1976. This committee was established at that time by the Subcommittee on Agriculture, Forestry, and Related Industries of Extension Committee on Organization and Policy (ECOP). Actually, Dixon Hubbard and Bill Durfey, being members of this national committee along with representatives from the National Cattlemen's Association, Beef Improvement Federation, U.S. Beef Breeds Council, Advanced Beef Breeds Federation, and various Extension specialists, have taken the leadership and deserve a great deal of credit. Dr. Taggart's guidance and willingness to issue the invitation to come to Oklahoma are also important ingredients in the culmination of this national workshop.

Reproduction or reproductive rate in beef cattle is a very broad subject which really encompasses the whole gamut of the production area surrounding the cow-calf business. We here, today, are tackling a very large problem and certainly not a new problem; but there is enough room in this particular subject and concern to involve nearly everybody and everything in the beef cattle industry. In this particular workshop, we are looking for methods and means to cope with the problems of a lower than optimum reproductive rate in beef cattle.

You have come here to this workshop because you were invited through one of several national organizations or associations. To this

---

Presented by A. L. Eller, Jr., Extension Animal Scientist, Virginia Polytechnic Institute & State Univ, Blacksburg, VA, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

conference were invited representatives of the following industries:

1. Artificial insemination industries--including sales, research, and veterinary personnel.

2. Pharmaceutical industries--including sales personnel, reproductive physiologists, and others.

3. Feed industry personnel--including nutritionists and sales people.

4. The veterinary profession--including bovine practitioners, representatives from veterinary colleges, Extension veterinarians, and others.

5. Extension and university representatives--including Extension beef cattle specialists, Extension veterinarians, and researchers.

6. Production sector--including representatives from breed associations, National Cattlemen's Association, Beef Improvement Federation, and others.

When the committee met early this year, the following objectives were identified:

1. Identify problems contributing to the low level of reproduction in beef cattle.

2. Identify opportunities for solving problems associated with low level of reproduction.

3. Identify factors which may limit our ability to solve these problems.

4. Prioritize the problems with respect to their economic impact and our potential ability to find feasible solutions with desirable benefits.

5. Determine what approach must be taken to solve each problem area, and determine what the end benefits would be.

6. Identify the respective responsibilities of industry and Extension both individually and collectively in solving these problems on a priority basis.

We hope to address and meet these objectives in the workshop.

In addition to the above objectives, some final objectives for getting a handle on how to get a job done were developed as follows:

1. Develop methodology for beef industry-Extension cooperation and action to increase calf crop percentage and shorten calving interval which would result in more pounds of calf weaned per cow per year.

2. Develop momentum for initiating new Extension-industry educational programs to improve beef cattle reproductive management.

3. Develop new methods which involve industry in more effectively extending existing educational materials and programs for improving beef cattle reproductive management.

4. Focus attention of Extension and industry on priority concerns related to beef cattle reproductive management.

With this base and with these outlined objectives, we ask that you listen attentively to the presentations made and then involve yourself vigorously in the work groups later in the workshop.

It is interesting to note that reproduction is listed among the largest problems in beef production and is at the top of the list for most research and Extension programs. As a result, more money and more manpower are being expended in this area all the time. More scientists work in the area of reproductive physiology than ever before. A review of the list of papers presented at the American Society of Animal Science meetings in Wisconsin in 1977 or in Michigan in 1978 affirms this.

Research has not provided as many breakthroughs as desirable but has explained to us why reproductive rate is the kind of beast it is to work with. They have pointed out such things as these:

1. Heritability is apparently low--approximately 10 percent. This is perhaps fortunate. It tells us that the composite of all environmental effects is perhaps 9 times as important as the genetic or heritable component. The Maker saw fit to make bovines and most other mammals, including man, such that a high percentage of them reproduce at a high rate provided environmental conditions are near optimum.

2. Environmental effects are very important. What are the environmental effects? There are many, but these may be some of the major ones:

   a. Effective nutritional level.

   b. Management of nutritional plane to meet needs in various phases of production in the cow.

   c. Disease control.

   d. General health.

   e. Management.

So as we address this subject, we see there is no magic; nothing is new. Very little exists perhaps that we don't already know something about. What we would like to do in this two-day workshop is exchange ideas; examine what we already know; determine what our largest problems are that affect reproductive rate adversely; and then set to work to find answers, educational delivery systems, and methods of communication that will improve the situation back home. What we want to do is get application of what we already know. We definitely need to learn from each other. We definitely need as an industry to work together. The biggest breakthroughs will be management breakthroughs and understanding breakthroughs, maybe even a "do as good as we know how to" breakthrough.

ooOoo

THE MAN IN MANAGEMENT -- KEYNOTE ADDRESS

We cowboys, ranchers, and farmers consider ourselves to be experts in a lot of different fields. One of them is football. We attend the Iowa State games every year and watch you Oklahomans come up there and demolish our spirits as well as our football team. Something I have noticed about the farmers sitting in the stands is, they consistently yell advice to the coach. The day after the game we also have lots of advice as to what our team should have done on "third down" and whether they should have punted or passed. But you know, I got to thinking, farmers and ranchers would really make lousy football coaches.

Now I'm going to draw a few parallels on how it would work if a rancher coached a football team the way he manages his cow herd. Imagine, if you can, a rancher football coach and certain players don't show up for practice. He says, "That's all right, Tommy. You don't need to show up for practice because you're a good guy and I'll give you another chance." Players who don't even show up for games, the farmer coach would say, "Oh, that's all right that you didn't show up for the game. Maybe you'll show up for the game next time." Now that's really the kind of excuses ranchers make about their cows that don't have calves; so I assume that if they were coaches, they would make similar excuses for the players who don't show up.

Now let's figure up how we ranchers would select our team members. The first thing we would do is select them by visual appearance. We'd line up all our squad. We'd walk out and say, "Hey, you look like a guard, so you play guard. You look like a tackle; you're wide in the hips and shoulders and obviously function follows form, so you play tackle. Oh, here's a long-legged tall one that has a lot of frame--we know that long-legged tall ones run fast and catch passes--so you can be the end." Here comes the important part--where we select the quarterback for the team. Now keep in mind that the quarterback for a football team is somewhat similar to the bulls used in a herd, so let's select a quarterback the same way we select our bulls. We would say, "Son, you are going to be quarterback because your mother was an Olympic swimmer, your grandmother won a footrace at the Podunk Center County Fair, and your father played football for the Chicago Bears; therefore, you have a wonderful pedigree to be a quarterback. You have slim hips, wide hands, and a square jutting jaw; therefore, you are the quarterback."

Presented by Dave Nichols, Merrill Nichols & Son, Anita, IA, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

Now I think you all would agree, you wouldn't have much of a football team if this was the way you selected the players. But, in a sense, isn't this really the way we are running our cow herd? Not pregnancy checking cows, letting cows calve year-around so they can calve when they want to, and not having a breeding season. Many purebred breeders' selection programs are based on the fact that, "Oh, we have got to keep this cow. She's a daughter of Snowflake, and Ole Snowflake is the grand old cow whose grandmother's half sister won first at the County Fair. She's been in the family for years. So what if Snowflake's daughter misses a calf. That's not heritable anyway. What we really want to do is breed Snowflake's daughter to Ole Blue Nut. Everyone knows that the Ole Snowflake-Blue Nut combination is the best thing going. If we can get enough cattle of this particular combination, we are going to have something really good." This is the mentality that pervades our industry when it comes to selecting cattle for reproductive traits.

Calving cows is a confused issue. Why are commercial producers so confused? First, when the veterinarian comes out on Easter Sunday morning and pulls a dead calf for him, the vet says, "My gosh, fella, you gotta quit breeding to that bull. You've got to get a small Angus bull to get rid of your calving problems." The next night the producer goes to an Extension meeting; and the Extension specialist says, "The thing that is going to make you money is to crossbreed your cows to a large performance-tested bull." He says, "By golly, that will solve my problems. I'll breed my heifers to Maine-Anjou next year." He then goes to a breeder who lives across the road who says, "Hey! Hey! Hey! Cattle breeding is a super complicated thing. Here we've got this pen of bulls. This bull is 48 inches high and will cost you $1,000; that bull is 46 inches, he's only $300." The producer says, "My gosh, the shorter bull has a better yearling weight." The breeder says, "Yeah, but the tall ones are worth more money."

So then what does he do? He goes to the bull test station and he finds out that if he doesn't have a bull that gains 4 pounds a day, he's not even going to be socially acceptable, let alone, what will the cows think if they are not bred to a bull that gains 4 pounds a day. And you wonder why this guy is confused! It's because we all have a tendency to accentuate our own biases, or merchandise whatever we have to sell; that's the easiest thing to tell a producer he should be doing.

When we started and only had 100 cows, it wasn't too bad to go check pastures several times a day. Before Lee, my brother, got married, it wasn't too bad at all to let him go check the cows. We then got up to about 600 cows; Lee got married; I got old; he got lazy; and

we decided that was the end of the checking of pastures. So here's what we do. Cows at our place calve by themselves unassisted or die trying--flat die trying. After a few years, you don't have to worry about them. It takes about two years. We check our cows once a day; tag and weigh the calves that were born in the last 24 hours; and we come back 24 hours later.

We check heifers 3 times a day. I used to check the heifers at night and all that stuff; but what happened is, I would go out and check the heifers at night. There would be 3 heifers calving. I would stand around awhile; go watch Johnny Carson awhile; I would then go back out and watch the heifers again. I'd go get my wife, Phyllis, out of bed and say, "Phyllis, we've got to pull this calf." She would change from her short-sleeve nightgown into more appropriate clothing, and away to the barn we'd go. About 2:30 in the morning, we would get back in after pulling a live calf. The next morning I would be laying there in bed, and the milk truck driver would knock and say, "Hey, you've got 3 heifers calving." I'd jump out of bed, go down there, and first thing I knew I was spending all my time calving those heifers. The solution to that is, we check them 3 times a day--morning, noon, and night. When I come in at night and put my feet on that footstool, any heifer that's going to calve that night is going to have to do it herself. This can be done, and I think must be done. I don't think farmers, now I'm talking about Iowa farmers, can afford to crawl off a tractor and go pull calves. The economics aren't there, guys. At 80¢ calves and 90¢ calves, you name it, you cannot crawl off a corn planter, a soybean planter, or a cotton planter to mess with calves. I think we've got to breed cattle that can calve by themselves. We are running about 800 mother cows now. We have found in our operation that when we check heifers 3 times a day, we will have to pull some calves. However, when we have a hard pull out of a heifer, we've only got a 50-50 chance of getting her re-bred. This is not good and should not be perpetuated.

How do we handle our bulls? We use bulls, plus some A.I. We have a 60-day breeding period once a year. We start calving the first of April. In other words, the bulls are with the cows from June 23 to August 23. As soon as the calves are weaned, the cows are preg-checked. Any cow that is open goes to market. I'll tell you why she goes to market. We may not be making great genetic strides; but what we are doing is, we're not letting freeloader cows stay around. We've got a few employees. If one employee does not show up for work, he's not paid--he doesn't expect to be paid. But yet, cattlemen will let a cow stay around for a whole year. It takes the profit from 5 other cows to pay the feed bill on that one old cow he's keeping over an extra year. Now, I tell cattlemen, "If you love ole Maude so much, if Maude comes up open and you want to let

Maude spend another Christmas with you, you are going to have to carry feed to 5 other cows just so Maude can spend another Christmas with you." Now, I don't have any cattle I love that much! You've got to get rid of the open cows.

Another thing that has to do with calf crop percentage is problem cows. Cows with bad udders; cows that don't claim their calves; or cows that don't take care of their calves. Here's what we do. We figure it takes 4 hours to get a cow in. It takes 4 guys, 1 hour; 2 guys, 2 hours; or 1 guy, 4 hours. Our employees get between $5 and $6/hour. Four hours is $20-$25. That's the profit on that cow. If we've got to get a cow in because she isn't claiming her calf or it can't get started nursing her, we have kept that cow for one year just for the joy of having that cow. So what happens? You've got a live cow and a live calf, what are you going to do with her?

Well, by the time you get that calf started on that old pendulous-uddered cow and she kicks you a few times and swishes you in the face, you are so made at her that what you'll do is--you will turn her back out without getting her properly identified. You will go home and give your wife hell about supper. So, a better solution! We get the cow in; we get the calf started. The last day then before we turn her out, we walk around to the front of this old cow--we're mad at her anyway--we take out our pocket knife; and we cut off her right ear. This helps us feel better by getting even with the cow. Now, when we are preg-checking cows, we can't be standing out there flipping through papers looking up information on every old cow; therefore, when a bob-eared cow comes down the chute, we save ourselves a dollar on the preg-checking bill. We just say to the vet, "Let her go through." She may cause us trouble one year, but she won't cause us trouble next year. Also, another good thing is, we know we never keep any of her daughters or sons.

Another thing we feel very strongly about is, cows that lose their calves whether it's their fault or not. This just has to do with maximizing the resources you have. Now, I know ranchers don't like to be called farmers. I live East of the Missouri, so I can still talk about farmers. But, by golly, West of the Missouri, cattlemen aren't farmers, they're ranchers! But we are all really farmers. We are just merchandising what lies in the parameter of our fences, that's all any of us are really doing. Therefore, any cow that loses her calf at our place is immediately sold.

I was visiting with C.K. Allen out here in the lobby. I wish he was here because I would want him to back me up on this. C.K. and I were looking at calves. There was a little calf laying in the grass. C.K. was supposed to be looking out for him; and I was

supposed to be driving. We ran over the calf and killed it. That calf's mother went to slaughter. Not because we are trying to raise intelligent calves who will get out of the way of a pick-up, but simply because there is no point in keeping that cow when I can replace her with two bred heifers for the same feed bill.

Another thing, we used to cry, "Oh my gosh!" when we'd have a first-calf heifer lose her calf. We would wring our hands and say, "Look what that heifer has cost us. We have weighed her at weaning; we weighed her at a year; A.I.'d her to select sires, super bull, and all; and here she goes and she loses this calf. What a disaster!" No disaster! The country is full of people who are backgrounding cattle on grass to get them ready for the feedlot. The heifer that loses her calf weighs twice as much as she did at weaning; we haven't lost any money on her. Put her in a feedlot. It doesn't make any difference whether it's her fault, our fault, or whose fault it was. When a heifer loses a calf, we turn her into money. The gain that heifer puts on from weaning until the time she has her calf is under the same price structure as backgrounding cattle. If you can't take the increase in weight on that heifer and make it wash on her feed cost, you're probably in big trouble anyway.

How do we select our heifers? We calve for 60 days. Are we successful? I think we are. This year, 1978, 23 days after we started calving our total cow inventory, 85 percent of our cows had live calves at side. This makes the third year in a row that we've been above 85 percent. I think the reason is, we have been selecting and culling for this. We try to do the very best job we can as far as management and nutrition of these cattle are concerned. I think raising cattle is a lot like raising corn. It isn't the one thing you do, but you get 2 or 3 percent from this and 2 or 3 percent from that; and I think this is why we are able to do this.

I want to take exception with the heritability of fertility. I was going to present just some glowing visual data on this, but we didn't have numbers enough to do it. We got in the Polled Hereford business 5 years ago. One of the really, really good moves we've made is to get involved with this breed. We really enjoy it. We started out with the idea, the best way to get involved in the Polled Hereford business was to buy cattle that were the best performers we could find anywhere that had been subjected to the same kind of selection pressure as we use. We bought heifer calves from 6 herds at weaning; brought them home; threw them in with our Angus heifers; and raised them up in the same way. This would have been in 1972. We gave $800.50 for these heifers at weaning in Canada. We breed our heifers for 45 days, 21 days AI, 23 days with clean up bull. We vowed even with these high-priced heifers, any heifer that was open was going to go in the feedlot. Now if you

want to see the eyebrows on your banker dance, just go in and tell him about your $800.50 heifers in the feedlot when cattle are worth about 32¢ in 1973--cheapest way to do it!

Here we are going back to the thing of heritability. The Hereford heifers from 2 herds were the same as our Angus as far as percent open, percent that calved, weaning weight, etc. Another herd was slightly below. Two herds were absolute failures. We looked back to see why these 2 groups of heifers were such absolute failures in getting bred, in calving, and consequently were gone. The one herd a super performance herd, the guy calved in February and loved them. He loved them! He would go out, and he would coddle them. When you're calving in January and February, you've got to be out there in Iowa, if this is what you're going to do. He also liked big calves at birth. The other herd was from a different place in Canada, but this guy also loved his cows. Everyone of them had a name. Using my Oklahoma computer, a "Big Chief" tablet, and a wooden pencil, I figured out there wasn't near enough calves on the place for the number of cows worked. Out of the one herd, we got 28 heifers. After 3 breedings, we had 4 left. We didn't cull any of them for anything except whether they had a calf. The other herd, the strong performance herd, where the guy calved early and loved them, we had 5 left out of 31. But there was differences between those 2 groups of cows. The one group of cows the guy just loved them, they were lazy cattle. Flat lazy rips that would stand there and eat grass while they were trying to have a calf. The problem in the other herd was all related to birth weight. These cows had huge calves, and they were all bred to the same bulls. This group of heifers would breed the first time, but they either would lose the calf calving or come up open the second time around. I think this is something purebred breeders and bull studs have got to get serious about--that's birth weights. Now I know it's fun to stand around and talk about--it isn't the weight of the calf, it's the shape of the calf, and a whole bunch of bologna like that, which is what it is, bologna. We have got to get serious about birth weights!

Back in the 1950's, we started performance testing in 1957, commercial men were coming in and they would say, "What in the world am I going to do about these calves. I've been buying these high-priced bulls; and everytime I sell my calves, they are 20 pounds lighter than they were the year before. What's the matter with you guys pawning all these little, long-haired toads off on us. I buy bulls at a sale; bring them home; their feet grow out; their hair goes down; and they only weigh 1,000 pounds and are a little lighter than that at maturity. We've got to have some growth."

Now one thing I am an expert on is selling bulls. We sell over 300 yearling bulls a year, and they are all sold by private treaty.

I'll tell you what! We have got a damn big problem with calving and the commercial man knows. Now, when he's down at the local coffee shop, he's not going to talk about it. However, we have birth weights available for all our bull buyers. Last year was the first time I can ever remember that commercial buyers in general would give up a bunch of yearling weight to get a light birth weight bull. And the sad part about it is, many of these people are those who have been spending the most money for bulls. It's a problem; it's out there; and we Angus and Hereford breeders have set around and said, "That's the exotic problem," and thinking it was somebody else's problem. We've got Simmentals. It isn't the exotic problem, folks, and it's real; and that's one thing (birth weight) I think really affects reproduction.

Now, some breeders say, "Well heck, my cows have 120-pound calves with no problem. Therefore, birth weights are nothing to worry about." I believe the seedstock operators when they say their cows have 120-pound calves without any difficulty; but I will tell you one thing, our cows have problems having 120-pound calves. The average commercial cow in Adair County, Iowa, cannot have a 120-pound calf. Sure, I can tell you about the old cow that lays down and has a big calf in five minutes, and so on; but I'll never live long enough to change my whole herd so they can all have 120-pound calves without problems. The way the commercial cattle industry works is that people lose identity of the cattle as far as which calves are sired by which bulls. I don't believe we can ever sell bulls that weigh over 90 pounds at birth to our commercial customers and be doing them a service. Now granted, if they would stick around and continue using those 100-pound plus birth weight bulls long enough, their cows would probably be able to have 100-pound calves. But if they go broke in the meantime, I'm going to have a hard time selling them on the idea of going broke so they can have a set of cows that can have calves that weigh 100 pounds plus at birth. I think we have got to take cows as they are and genetically engineer the high performing, fast growing animal that has birth weights acceptable for the cows that are presently in the population today.

I cannot be anything but optimistic about the future. Four-fifths of the land in the United States is unsuitable for crop production. We are dealing with an energy shortage, a shortage requiring more and more fossil fuel for just running the machines, making fertilizer, etc. We have this great renewable resource called grass. There are really only two animals that can effectively convert this renewable resource, and these are cattle and sheep. Personally, I can't see many ranchers going into the sheep business, but I can see them going into the cow business. Also, with the cow, we have one of the greatest graineries that mankind has ever known.

In the good years, we increase our cow herds. When the drought and lean years come along, we then have this great grainery of edible protein grazing our fields and pastures; and we can slaughter these cows for our people to eat. I think we have taken cows and agriculture for granted in the same way we took energy for granted for many years. This cheap source of food is always going to be there, and it is always going to be cheap. I really believe we farmers and ranchers are the oil sheiks of tomorrow. I think the coal, oil, and energy situations of today will just be considered a small eye blink in history, and the people who will enjoy the great benefits as far as financial considerations and quality of life are going to be the farmers and ranchers. I think we have got to plan for the future and assume the future will be bright. Thus, let us get our house in order and get our cows and land productive and charge forward.

ooOoo

NUTRITION AND ITS EFFECT ON REPRODUCTIVE PERFORMANCE OF BEEF CATTLE

Introduction

In a commercial beef cattle operation, the goal of most operators is to optimize the pounds of calf produced per cow in that herd. It is important to do this in the most economical manner. Many factors will influence this, but one of the keys is to achieve a high level of reproductive performance; and a very important part of successfully accomplishing this is a sound nutrition program.

One of the difficulties in discussing nutrition at a workshop such as this, is the wide variation that exists in nutritional programs followed by commercial cow operators in the various regions of the United States. Some regions are extremely arid and as such a very extensive cow-calf production program is followed. Under conditions such as this, it may be impractical and uneconomically feasible to achieve as high a level of reproductive performance in a cow herd as might be achieved in other areas of the United States. Contrasting this are parts of the United States where intensive production programs can be followed because of adequate rainfall. Under these conditions, a higher standard of reproductive performance often is possible.

Many factors have changed in the beef cattle industry over the last ten years that need to be considered when discussing a nutritional program. In our genetic selection program, we have selected for increased size and growth rate as well as increased cow size and milking ability greatly altering the cow's nutritional requirements. Coupled with selection has been the increased use of the new breeds introduced in the last 10 to 15 years in the cattle industry. Use of these breeds has increased the size of our cows and, in some cases, the milking ability of the cows. In many areas of the country, we have made major improvements in the kind of forage that is utilized. We have also made major improvements in the kind of forage harvesting equipment that is available, with this having a big influence on the kind of nutritional programs we are capable of following.

Presented by Larry R. Corah, Extension Beef Cattle Nutritionist, Kansas State Univ, Manhattan, KS, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

Evaluating Reproductive Performance

Before we get in to discussing the role of nutrition in reproductive performance, it is important that we consider some of the ways we need to evaluate a successful reproductive performance from a commercial cow herd. Unfortunately, in the industry, the common method of evaluating reproductive performance is simply the percent of cows pregnant each year.

There is more that needs to be considered. First, we need a high percentage of the cows weaning calves each year. Next, we need to realize that in every area of the United States there is an optimum time to calve. This is illustrated in the following table. From data collected by research workers at South Dakota, the optimum time to maximize average daily gains was to have the cows calving in February or March. Calves born later than this period of time had lower average daily gain and lighter weaning weights, not only because they were later-born calves, but because they were slower-gaining calves.

TABLE 1. EFFECT OF MONTH OF BIRTH ON 190-DAY WEIGHT OF BEEF CALVES (South Dakota)

Month Of Birth	Number Calves	Pre-Weaning Rate of Gain	190-Day Weaning Weight
February	108	2.07	464
March	710	2.00	451
April	979	1.91	434
May	351	1.86	424
June	124	1.77	407

Every region of the United States will have an optimum time to calve; and as such, we want to achieve as high a percentage of calves being born during this period as possible. As such, another important way of evaluating reproductive performance is to determine the percent of calves born by 21-day periods which is analagous to the estrual cycle of the beef cow. As shown in the following data collected in Kansas, for each missed 21-day period of time or for each 21 days later that a cow bred, we lost 30 to 40 pounds of weaning weight. This is unadjusted weaning weight; but in the commercial beef cattle industry, this is the pounds of calf an operator can actually sell.

TABLE 2. COWS' CALVES BORN BY 21-DAY PERIOD*

	No. Calves	Weaning Weight
First 21 Days	38	444.9
Second 21 Days	78	414.6
Third 21 Days	19	345.5
Fourth 21 Days	6	329.2
Fifth 21 Days	11	267.7

*Data from a herd in Gray County, Kansas.

In many commercial beef operations, long calving seasons and poor nutrition programs prevent a high percentage of the cows from cycling and breeding early. In data collected from three Kansas herds, it can be noted that percent of cows observed in heat the first 21 days ranged from 98 percent to 35 percent.

TABLE 3. REPRODUCTIVE PERFORMANCE OF THREE KANSAS COW HERDS

	Herd 1	Herd 2	Herd 3
Number cows	41	40	40
Length breeding season	45 Days	107 Days	135 Days
Percent cows cycling by:			
21 Days of breeding season	98%	45%	35%
30 Days of breeding season	98%	58%	50%
45 Days of breeding season	100%	68%	(Stopped Checking at 30 Days)

The Role of Each Nutrient In The Cow Herd Nutrition Program

1. Energy

The first nutrient to consider is the one that is most important in a cow herd nutrition program and also comprises the major expense from a feed standpoint in maintaining a set of beef cows, that being energy or TDN. The role of energy in a cow herd nutrition program has been well documented in many research trials over the years. It plays an extremely important role in reproductive performance, calf weaning weights, and in the overall productivity per cow. In most cattle operations, the bulk of the energy consumed by cows comes from grazed forage or by feeding harvested roughage.

Some of the classical research emphasizing the importance of energy in a cow herd nutrition program was the work done by Dr. Jim Wiltbank, formerly of the Fort Robinson Experiment Station in Nebraska. As shown in the following table, that outlines the experimental design of his work, he set up a nutritional experiment that evaluated energy levels pre- and post-calving.

TABLE 4. NUTRITION BEFORE AND AFTER CALVING-COWS (Wiltbank)

TDN		POUNDS TDN	
Before Calving	After Calving	Before Calving	After Calving
High	High	9	16
High	Low	9	8
Low	High	4.5	16
Low	Low	4.5	8

As shown in Table 5, the level of energy prior to calving had a major influence on the percent of cows cycling by 50 and 90 days after calving. In the 2 treatment groups where a high level of energy was fed pre-calving, the interval from calving to first estrus for one group was 48 days and for the next group 43 days. Contrasting this, when low levels of energy were fed pre-calving, it took 65 and 52 days, respectively, from calving until first estrual activity was observed.

TABLE 5. EFFECT OF FIRST POSTPARTUM ESTRUS (Wiltbank)

	TDN LEVEL			
	High/High	High/Low	Low/High	Low/Low
Interval to First Estrus	48 Days	43 Days	65 Days	52 Days
Percent Showing Heat By:				
50 Days After Calving	65	76	25	6
90 Days After Calving	95	86	80	22
Didn't Show Heat	0	14	5	78

Table 6 illustrates the importance of energy levels after calving. In Dr. Wiltbank's work, when cows were fed a high level of energy after calving, they achieved a higher first

service conception rate and overall pregnancy rate. This emphasizes that energy levels pre-calving have a major influence on the percent of cows cycling at the start of the breeding season. Also, post-calving energy level will be a major determinant of the conception rates of those cows.

TABLE 6. EFFECT OF ENERGY POST-CALVING ON PREGNANCY RATE

Calving Time To Breeding	Pregnant From 1st Service (%)	Pregnant After Breeding 20 Days (%)	Pregnant After Breeding 90 Days (%)	Cows Not Showing Heat (%)
Losing weight (8 Lbs TDN)	43	29	72	14
Gain weight (16 Lbs TDN)	60	57	82	0
Difference	17	28	10	14

As shown in Table 7, Dr. Wiltbank's work also outlined the importance of energy after calving on calf weight gains. When cows were fed low levels of TDN post-calving, the weight gains of the calves at 109 days were 179 pounds. Contrasting, when they were fed a high level of energy post-calving, calves weighed 204 pounds in a comparable 109 days.

TABLE 7. EFFECT OF ENERGY RESTRICTION POST-CALVING ON CALF GAINS

Level of Feed		No.	Calf Weight
Before Calving	After Calving	Cows	At 109 Days
8.0 Lbs TDN	7.0 Lbs TDN	42	179
9.0 Lbs TDN	13.0 Lbs TDN	37	204

Unfortunately, in the cattle industry, there are many mistakes made in feeding the proper level of energy to cows during the 365-day period of time. Let's consider some of these mistakes.

a. Fail to consider the stage of production the beef cow is in when deciding on the level of energy to feed.

One of the biggest factors influencing energy requirements is whether the cow is lactating or dry. There are many ways to break up a 365-day beef cow year, but the following table illustrates the beef cow year divided into four distinct periods, and Table 9 lists the nutrient requirements for each period.

TABLE 8. THE 365-DAY BEEF COW YEAR BY PERIODS

Period 1	Period 2	Period 3	Period 4
82 Days (post-calving)	123 Days (pregnant and lactating)	110 Days (mid-gestation)	50 Days (pre-calving)

TABLE 9. NRC REQUIREMENTS--1100 LB BEEF COW

	Periods			
	1	2	3	4
TDN (lbs/day)	13-15*	11-12	8.5	10
Protein (lbs/day)	2.0	1.6	.9	1.1
Dig. Protein (lbs/day)	1.2	.9	.45	.55
Calcium (grams/day)	27	24	13	15
Phosphorus (grams/day)	27	24	13	15
Vit. A (I.U./day)	24,000	24,000	24,000	24,000

*Depends on milking ability, age, and condition.

A brief description of the four nutritional periods is as follows:

Period 1. Period 1 is the 82-day period after calving when the cow is lactating at her highest level while trying to maintain a high level of calf growth. In addition to this, the cow must undergo uterine involution, start recycling, and re-breed during this period. Obviously, to the beef cow, this is her most important nutritional period.

Period 2. During this period, the cow should be in the early part of pregnancy while still lactating and maintaining a calf. It is also during this period that the cow should be gaining weight and laying on some energy reserve as body weight and fat to prepare for the winter months, assuming a spring calving situation.

Period 3. This is the period that follows the weaning of the calf and is referred to as mid-gestation. Basically, during this period of time, the beef cow must primarily maintain her developing fetus. During this period, the beef cow's nutrition needs are at the lowest level of any stage of the year.

Period 4. This period is the second most important period during the beef cow year and again is a period when many of the producers fail to feed the cows as well as they should be fed. During this period, 70 to 80 percent of the total fetal growth occurs; and in addition, the cow is preparing for lactation.

The following research trial conducted at the University of Wyoming showed the importance of nutrition to the beef cow during Period 4. In the following research trial, starting 100 days prior to scheduled calving, cows were individually fed the same level of energy and protein up to 30 days pre-calving. Starting 30 days prior to their scheduled calving, one group of cows had an increased energy level to 10.6 pounds of TDN, while the other group remained on the continuously restricted energy level. After calving, both groups were fed as a group the proper level of TDN and protein.

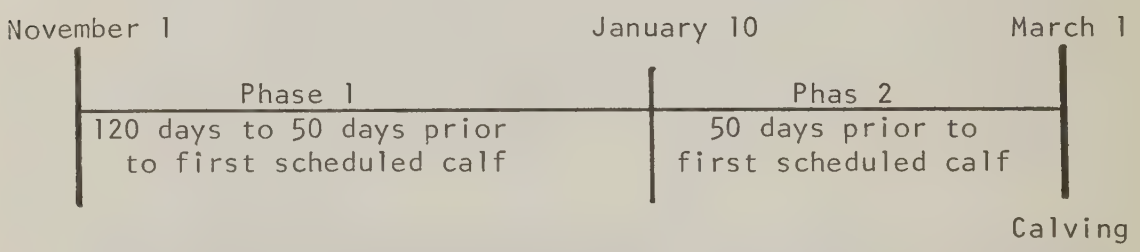
TABLE 10. EXPERIMENTAL DESIGN AND COW AND CALF PERFORMANCE

	Continuous Low	Elevated Last 30 Days
Level of Energy		
a) Lbs of TDN first 70 Days	4.6	4.6
b) Lbs of TDN last 30 Days Pre-calving	4.6	10.6
Weight Change		
a) First 70 Days	-119.2	-114.6
b) Last 30 Days	-23.0	+92.8
Birth Weight	58.7	67
Calf Livability		
--at birth	90.5	100
--at weaning	71.4	100
Percent calves treated for scours	52.0	33.4
Cows milk production	9.1	12.0
Weaning weight	294.4	320.1
Percent in estrus by 40 Days Post-calving	37.5	47.6

This work illustrated that a low level of energy 30 days pre-calving reduced birth weight, calf livability, cow's milk production, and calves weaning weight while increasing the onset of health problems in the calves and increasing the length of time from calving to the first post-partum estrus.

In the previous research trial, the cows were individually fed. Applying this to a more practical situation, a trial was run at Kansas State University in which the plane of nutrition was elevated 50 days prior to the first calf. As can be shown in the following table, when this was done, even those cows that had lost weight up to this point of time still produced very acceptable calves when properly fed starting the last two months prior to the first scheduled calf.

TABLE 11. BREAKING THE LAST 120 DAYS OF PREGNANCY INTO TWO PHASES*



EFFECT OF RATIONS ON COW AND CALF PERFORMANCE

	Treatment 1	Treatment 2	Treatment 3
Level of energy**:			
Phase 1	NRC	70% NRC	70% NRC
Phase 2	NRC	NRC	70% NRC
Weight Change:			
Phase 1	60.3	-15.4	14.6
Phase 2	85.7	130.9	75.6
TOTAL	146.0	115.5	90.2
Birth Weight	72.9	71.3	69.2
Milk Production	11 lbs	12 lbs	9.8 lbs
Percent First Service Conception	37%	48%	25%
Conception--60-Day Breeding Season	80%	82%	68%

*108 first calf heifers involved in the study.
**NRC level of energy = 8.4 lbs TDN; while 70% NRC = 5.8 lbs TDN.

b. Fail to consider cow size.

In the last 10 years through selection in our conventional breeds such as the Hereford and Angus and through incorporation of some of the newer breeds, we have greatly increased cow size in many of the herds around the various areas of the United States. As we increase cow size, we greatly increase nutrient requirements, not only for energy and protein, but also for mineral and vitamins as well. Unfortunately, in our feeding program, we quite often do not take into account the increase in energy and protein and other nutrients that is necessary as we go from a 1,000 to 1,100 to a 1,200-pound cow. The following table illustrates the requirements for a 900-pound cow versus a 1,200-pound cow.

TABLE 12. REQUIREMENTS AS INFLUENCED BY COW SIZE OR WEIGHT (900-lb Vs. 1,200-lb Cow)

	900 lbs	1,200 lbs
TDN/Day	7.0	8.8
Crude Protein	.85	1.04
Dig. Protein	.4	.5
Calcium	11	13
Phosphorus	11	13

Further work emphasizing the importance of cow size on total nutritional requirements has been done at Ohio. In their work as shown in the following table, they compared cows with an average weight of 874 pounds to those weighing 1,022 pounds to those weighing 1,210 pounds. As we increase cow size, as would be expected, we increase the total TDN required by the cow and calf. In contrast, however, the TDN required per pound of weaning weight remained fairly constant.

TABLE 13. EFFECT OF COW SIZE AND PERFORMANCE ON POUNDS OF CALF PRODUCED AND FEED NEEDS (Ohio 1974)

	Average	Weight Class of Cow 1	2	3
Number of Cows		51	50	32
Average Cow Weight	1035	874	1022	1210
Calf Weaning Weight	434	405	433	464
TDN/Weaning Weight	9.5	9.4	9.5	9.6
Feedlot TDN/Gain	5.2	5.1	5.2	5.3
Total TDN Cow & Calf	6540	6169	6505	6946

c. Fail to consider level of milk production.

Right along with selecting for increased cow size, beef producers have been selecting for increased weaning weights. In the process of selecting for increased weaning weights, they have been increasing the milk production of these cows. In some cases, this has been done within the conventional breeds; but in other cases, added milk production has been accomplished through the use of some of the new breeds or some of the dairy breeds. In planning our nutritional program, here again, unfortunately, we often do not take into account how much affect the increase in milk production will have on the TDN and protein requirements. As shown in the following table, going from a cow producing 11 pounds of milk to one producing 22 pounds of milk without any alteration in cow's size increased the TDN requirement by 28 percent and the crude protein requirement by 42 percent for those cows during that initial period 1 following calving.

TABLE 14. EFFECT OF MILK PRODUCTION ON NUTRIENT NEEDS

	Level of Milk Production 11 Lbs	22 Lbs	% Increase
Post-calving Nutrient Needs (1,000-lb cow):			
TDN	11.0	14.1	28
Crude Protein	1.9	2.7	42

Further work illustrating the effect of milk production on increased nutrient needs has been published by Oklahoma State University. In their work, they compared Hereford and HerefordxHolstein-cross cows run on native grass and fed various levels of supplementation. The Hereford cows produced the same weaning weight at 240 days and had the same conception rate when fed the moderate level of protein supplementation as when fed the high level. In contrast, with the HerefordxHolstein-cross cows, it took a higher level of winter supplementation in order to increase weaning weights and increase reproductive performance.

TABLE 15. PERFORMANCE OF TWO-YEAR-OLD HEREFORD AND HEREFORDxHOLSTEIN HEIFERS (Oklahoma 1973)

	Hereford		Hereford x Holstein	
	Mod.	High	Mod.	High
Calving Weight	885	904	988	995
Daily Supplement*	2.6	4.8	3.1	5.5
Daily Milk Yield	12.0	12.9	17.3	19.3
Weaning Weight (240 Day)	507	500	550	563
Percent Cows Re-bred	100	100	85	100

*Post-calving on native range - 30% supplement.

d. Fail to consider cow condition.

The method that most beef cattle operators use to determine whether extra feed is needed is the condition of the cows. As such, cow condition is a very important aspect of a practical cow herd feeding program. Recent research published by Dr. Jim Wiltbank and associates has illustrated that if cows enter calving thin, it will take longer for these cows to start cycling and a smaller percentage of them will breed early in the breeding season; and, likewise, overall conception rates will also often be reduced. In a practical cow herd feeding program, condition needs to be considered all through the feeding program but, particularly, at least 2 to 3 months prior to the onset of calving. At this point in time if the cows appear to be in a thin condition, the level of nutrition can be altered still maintaining a high level of productivity from these cows. In a research trial conducted at Kansas State University, spring calving cows were allotted in the fall of the year to 3 nutritional groups. Those cows that were fat were fed

only alfalfa hay in conjunction with the native grass that they were grazing, while cows in a thin condition were fed a considerable amount of extra energy in the form of 6 pounds of milo along with the 3 pounds of alfalfa. As can be noted in Table 16, the average date of conception and the overall conception rates for all 3 groups were the same. However, it is very obvious that if the thin cows had not been fed the extra energy during the winter period of time, there is no way they would have achieved the same level of reproductive performance.

TABLE 16. FEEDING ACCORDING TO CONDITION

Condition	Level Of Daily Feed	Weight Change	Conception Date	% Conception
Fat	3 Lbs Alfalfa	-115	June 21	93.7
Average	3 Lbs Alfalfa 3 Lbs Milo	-37	June 18	89.5
Thin	3 Lbs Alfalfa 6 Lbs Milo	+5	June 27	93.3

e. Fail to consider the effects of weather.

Environmental conditions have a major influence on the cow's nutrient requirements. Unfortunately, too often in our cattle feeding program, we fail to consider this aspect. During winter months, cold weather encompasses much of the cow-calf regions on the United States. When cows are subjected to cold weather that is below the thermal comfort zone of these animals, each drop in Farenheit should be accompanied by an increase in the level of energy fed to these cows. It is important that a cow herd operator recognize what nutrient he needs to supply in cold weather. Cows will respond and need added energy during this period of time, but not added protein to maintain the same level of body weight.

f. Feed all cattle as a group.

Feeding all cattle as a group is, unfortunately, a common practice. In our cattle management programs, many of our commercial cow herds are fairly small, averaging only 10, 15, or 25 cows. As such, there often are not adequate

pastures to separate the lactating cows away from the pregnant cows and, even more importantly, to separate the young replacement heifers away from the old cows. This creates major problems in feeding a set of cows. Unfortunately, they are quite often fed an average level of nutrients; and as such, those cows that need a high level of energy or protein to achieve proper levels of lactation or reproductive performance are not being fed to achieve that.

g. Fail to properly grow and develop replacement heifers.

In the beef cattle industry, one of the major problems is calving difficulty resulting in dead calves being born to first-calf heifers. Right along with this, a major economic loss is the failure of a first-calf heifer to re-breed. If we are making the kind of genetic progress that we want, we must retain a first-calf heifer in the herd to at least produce more than just one calf. Proper nutritional development of this heifer from the time she is born until she successfully re-breeds with her second calf is an extremely important aspect of a good cow herd nutrition program.

In feeding energy to beef cows, the bulk of the energy is supplied by some type of grazed forage, whether it be seeded improved pastures or native grass. It is impossible, in a discussion such as this that encompasses all regions of the United States, to get into the specifics of the nutritional content of the grasses. However, it is extremely important that we have an understanding of the nutritional content of this grass at the various times of the year for each region in order to plan a cow herd nutrition program. Certain grasses will achieve their highest level of productivity in the early spring and be low in summer months. In contrast, much of the native grass region will achieve its highest level of nutrient content in late spring, early summer. If we are able to calculate and determine the TDN, protein, mineral, and vitamin content of this grass, then coupling this information with some understanding of the expected intake of these cows of the different types of grasses at different times of the year, we are better able to formulate a nutritional program for these cows. One thing we must recognize is, cows as well as all beef animals grazing any grass will selectively graze. Research compiled at Kansas State University as well as other schools has shown that even though a clipped sample of grass may show a 5 percent protein content, by being able to selectively feed, cows will be consuming grass that will have a protein content

of around 7 percent or 8 percent. It is also common that the cows will increase the level of energy in their diet simply through a selective feeding program.

One of the difficulties in planning cow herd nutrition is getting a handle on the expected forage intake by month. Recent research conducted at Colorado State University as well as at other schools has helped shed some light on the expected intake of cows grazing forage at different times of the year. Based on this work, we have formulated Table 17 which shows the expected forage intake by month. Cattle out on native grass in mid-winter would have an expected intake of dry grass of about 1.5 percent of their body weight. Contrasting this is the expected intake during late spring at somewhere around 2.5 percent to 2.7 percent of their body weight. The intake of native grass will gradually decline during the late summer and early fall months, reaching a low level in January and February. We must all recognize, however, that there are many regions of the United States where cows would simply not be able to achieve this type of dry grass intake because of snow cover preventing intake or else because of a lack of available forage during this period of time.

TABLE 17. EXPECTED FORAGE INTAKE BY BEEF COW

Month	Percent of Body Weight In Dry Matter Intake
January	1.5%
March	1.5%
May	2.6%
July	2.2%
September	1.9%
November	1.7%

2. Protein

The second most expensive nutrient in a cow herd nutrition program is protein. Protein particularly plays a major role during lactation. Likewise, it plays a major role by affecting the appetite of those cows, altering the level of forage they will consume, and as such altering the level of energy they will take in. Another big reason to consider protein is, it is often the nutrient most likely to be purchased in a typical cattle operation. Unfortunately, in the cattle industry in many cases, we put too much emphasis on protein and not enough

emphasis on level of energy fed to a group of cows. Some of the common mistakes in feeding protein to beef cows are shown below:

a. Protein is often over-fed to cows during mid-gestation.

A typical 1,000-pound cow of average producing ability will need only .8 to 1 pound of crude protein during the middle part of gestation. Yet in many cases, producers will feed a roughage of fair quality during this period and will feed a protein supplement when in fact it is not needed.

b. Producers often under-feed protein after calving.

When a cow calves, her requirements for protein double. For a cow producing 11 pounds of milk, her protein requirements are 1.9 pounds of crude protein after calving. But, when that cow produces 22 pounds of milk, her level of protein needed is increased to 2.7 pounds.

c. We under-feed protein to growing cattle.

A very intrical part of growth in any young animal is protein. As we develop replacement heifers, it is very important to feed an adequate level of protein or the desired growth will not be achieved. This is particularly important when we group-feed our replacement heifers along with older cows, and we feed an average level of protein to these cattle. Thus, we grossly under-feed protein to the young cattle.

d. We mis-use NPN or urea in cow herd nutrition programs.

Urea is a very cheap source of protein and, in many cases, can be very successfully fed to cattle--particularly feedlot steers. Yet in most cow herd nutrition programs followed around the United States, where forage is often limited or forage is of low quality, urea is poorly utilized because of a lack of available energy. When urea is utilized with a set of beef cows under these conditions, there is often a negative response to the high urea protein supplements causing an increase in weight loss and, subsequently, a reduction in weaning weights and reproductive performance. In order for urea to be successfully utilized, it must be accompanied by adequate energy which is quite often not the manner in which our beef cows are fed. Table 18 is based on work done at Iowa State University in which cows were fed very low levels of protein pre- and post-calving and

compared to cows fed an adequate level of protein. As can be shown, an improper level of protein in a cow herd nutrition program greatly alters the weight change of the cows; has no effect on birth weight of calves; but dramatically affects milk production, weaning weight, and subsequent reproductive performance. An ideal and well-managed cow herd nutrition program will feed an optimal level of protein to allow cows to achieve the kind of productivity they are capable of achieving.

TABLE 18. EFFECT OF PROTEIN LEVELS ON THE PRODUCTIVITY OF MATURE COWS

	Treatment	
	Low Protein*	High Protein**
Cow Weight Change Pre-calving	-121 Lbs.	-8 Lbs.
Cow Weight Change Post-calving	-50 Lbs.	-25 Lbs.
Calf Birth Weight	75.3 Lbs.	75.6 Lbs.
Cows Milk Production/Day	10.9 Lbs.	14.7 Lbs.
Calf Weaning Weight (163 Days)	308 Lbs.	341 Lbs.
% Cows Showing Estrus	51%	87%
% Cows Pregnant	53%	87%

*Low Protein = 3.1% protein pre-calving and 7.8% post-calving.
**High Protein = 11.9% protein pre-calving and 13.2% post-calving.

3. Phosphorus

Probably one of the most difficult nutrients to discuss in terms of its role and importance in cow herd reproduction is phosphorus. It appears, based on the research data collected to date, that the phosphorus needs and requirements will vary from one region to the next. In recent work published at the University of Arizona in which they compared 2 levels of phosphorus feeding in a 140-day trial starting 30 days post-calving, increasing the level of phosphorus greatly increased first service conception rates and overall conception rates as was shown in Table 19.

TABLE 19. EFFECT OF PHOSPHORUS ON REPRODUCTION

	Level Of Phosphorus (As % of NRC)*	
	106%	157%
Number cows	17	17
Weight change	+106 Lbs.	+91 Lbs.
1st Service conception	59%	89%
Net conception	94%	100%
Milk production	14.1 Lbs/Day	15.6 Lbs/Day
Calf gain (143 Days)	375	376
Grams phosphorus/day	24.5	36.3

*143 day trial - starting 30 days postpartum.

However, contrasting this was a recent paper published by the University of Utah in which 98 heifers were individually fed 2 levels of phosphorus over a 2-year period of time with a dramatic difference in phosphorus intake over this period. Different levels of phosphorus had no affect on average daily gain, percent of heifers cycling at 15 months, overall pregnancy, or percent of cows pregnant in the first 30 days of the breeding season.

TABLE 20. EFFECT OF PHOSPHORUS ON HEIFER DEVELOPMENT

	Level of Phosphorus (As % of NRC)	
	66%	172%
Number Heifers	48	48
Avg. Daily Gain (15 months)	.98	1.0
% Cycling - 15 months	73%	81%
% Pregnant - net	97%	100%
% Pregnant 1st 30 days	86%	76%
% Live Calves	91%	93%

Unfortunately, research does point out major discrepancies in the response to phosphorus. This research data generally points out that more of a response to phosphorus will be gotten when the cows are located in some of the Southern States, such as the region from Texas to California. In contrast, in many of the Northern States where cows are hand fed a fairly high percentage of the winter ration, there is less of a response to phosphorus. This leads us to the following recommendation: It would appear that in many regions of the country where cattle are grazed on dry grass during the winter months or where cows

are "roughed" on some type of the crop residue material that is low in phosphorus, it is imperative that the cows receive adequate phosphorus supplementation. Phosphorus would appear to have its greatest importance to the beef cows starting at least 60 to 100 days prior to calving and then 100 days post-calving or through the breeding season.

One of the important factors that influences the phosphorus requirement is not only the level of phosphorus of the forage but the apparent absorption of that phosphorus by the animal's system. In recent work done at West Virginia, they compared four types of roughages that all had similar levels of phosphorus at the time they were harvested. In contrast, as shown in the following table, there was a dramatic difference in the absorption of phosphorus in the digestive tract of the cattle.

TABLE 21. DIGESTIBILITY OF PHOSPHORUS IN ROUGHAGE (West Virginia)

	Rye Grass	Brome	Orchard Grass	Fescue
% Concentration of Phosphorus	.30	.27	.28	.28
% Absorption of Phosphorus	15.1	20.6	14.7	-7.3

Summary

From the above mentioned work, I think it is very obvious that a very intrical part of achieving the desired level of reproductive performance in a set of cows is having a sound and complete nutrition program. There are many things that must be emphasized, but the real key is using a proper blend of energy, protein, minerals, and vitamins. There are also many management factors that greatly help a good nutrition program. When a producer follows a short calving season, such as a 45- to 70-day calving season, it is considerably easier to plan a sound nutrition program than when his cows calve over an extended period, such as 120 to 180 days. When long calving seasons are used, general averages are used in feeding the cows; and in many cases, they are improperly fed. Any type of program we can follow in our area that emphasizes forage quality along with improvement in both quantity and quality of the pastures and range will be helpful towards having a good cow herd nutrition program.

ooOoo

DEVELOPING REPLACEMENT HEIFERS

Optimum reproductive performance in first-calf heifers depends on two major factors: (1) The heifer must come in heat and conceive early in the breeding season; and (2) The heifer must have a live calf at side at weaning. These two factors depend on adequate development of replacement heifers.

Results from the Havre, Montana, Station have indicated there are definite production potential differences in 2-year-old heifers that produce calves as a result of their first breeding season. Heifers that calved early in their first calving season continued to calve early and wean heavier calves throughout their lifetime. Heifers that calved late in their first calving season continued to calve late and wean lighter calves throughout their lifetime. Heifers that fell into the late calving group had a much more erratic reproductive performance than did the early calving group. The most common factor in the erratic production was calf production in alternate years.

This points out the possibility of exercising selection for reproductive performance in first-calf heifers by selection for pregnancy and particularly for heifers that conceive early in the breeding season.

The effect of early calving of heifers on their future reproductive performance and pounds of calf produced has also been studied in work at Colorado State University. One hundred forty yearling Angus heifers were assigned to a Control and New Management group. Breeding of heifers started 21 days earlier than the cow herd, and estrous synchronization was used in the New Management group. In addition, 70 percent more heifers were exposed than were needed as replacements. Replacement heifers returning to the New Management herd were selected entirely on the basis of conception early in the breeding season. Breeding season duration was 45 and 90 days for the New Management and Control groups, respectively (Table 1).

Presented by R. A. Bellows, Research Physiologist, Livestock and Range Research Station, Miles City, MT, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

TABLE 1. DESIGN OF STUDY

Item	Group	
	New Management	Control
No. pregnant replacements needed	50	50
No. exposed for breeding	85	54
Breeding season started (date)		
As heifers	4/22	5/12
As cows	5/12	5/12
Length of breeding (Days)	45	90
Estrous synchronization	Yes	No
Selection criteria	Early pregnancy	Pregnancy--adjusted weaning weight and conformation score

These management changes resulted in marked differences in calving dates as shown in Table 2.

TABLE 2. DISTRIBUTION OF CALVINGS DURING FIRST CALVING SEASON

Calving time	New Management Group		Control Group	
	No.	%	No.	%
February 9 or before	31	62%	0	---
February 10 to March 6	19	38%	23	57%
March 7 to March 26	0	---	7	18%
March 27 to April 16	0	---	7	18%
April 17 and after	0	---	3	7%
Total	50	100%	40	100%

The criteria for measuring reproductive performance were cows in heat and cows pregnant. In following years, replacement heifers which were retained were handled as shown in Table 1 and were not switched between herds. Results (4-year average) are summarized in Table 3.

It can be seen that more cows exhibited estrous and became pregnant early in the breeding season in the New Management group. This resulted in an increase in weaning weights since the calves were older and, therefore, heavier at weaning. It is interesting to

note that the final pregnancy rates were almost identical between the two groups (87 percent and 90 percent for New Management and Control groups, respectively). But, remember, the 87 percent was obtained in a 45-day breeding season and the 90 percent in a 90-day breeding season.

TABLE 3. EFFECT OF MANAGEMENT SYSTEM ON ESTROUS, PREGNANCY, AND WEANING WEIGHTS

	Group			
	New Management		Control	
	Estrous	Pregnancy	Estrous	Pregnancy
	%	%	%	%
First 21 days of breeding season	95	70	77	46
First 45 days of breeding season	100	87	96	75
By end of breeding season	100	87	--	90
Calf weaning weight (lb.)	433		396	

Thus, we have data that show just getting a heifer in heat and settled during the breeding season is not enough. We must make an effort to have the heifers in a condition that they can conceive early in the breeding season so they can calve early in their first calving season. This, in turn, will set the stage for production of more and heavier calves within the animal's lifetime. These findings emphasize the importance of heifers reaching puberty by 14 months of age.

Genetic Effects

Breeds differ in age and weight at puberty. A summary of these differences is shown in Table 4. Breed differences can be clearly seen, and location differences are also evident. However, the location differences are a result of not only location but sire, dam, and nutrition influences.

TABLE 4. AGE AND WEIGHT AT PUBERTY AT VARIOUS LOCATIONS[a]

	Age at Puberty (days)								Weight at Puberty (lb.)					
	Brooksville, FL	Gainesville, FL	Baton Rouge, LA	Jeanerette, LA	Miles City, MT	Clay Center, NE	Fort Robinson, NE[b]		Brooksville, FL	Jeanerette, LA	Miles City, MT	Clay Center, NE	Fort Robinson, NE[b]	
							High	Low					High	Low
Straightbreds														
Angus	---	---	387	433	360	372	337	396	---	536	588	602	552	513
Charolais	---	---	---	---	370	---	---	---	---	---	700	---	---	---
Hereford	456	---	471	---	386	390	413	457	500	---	596	592	673	592
Red Poll	381	---	---	---	---	---	---	---	---	---	---	---	---	---
Shorthorn	---	---	---	---	---	---	318	413	---	---	---	---	535	497
Brahman	511	583	538	816	---	---	---	---	675	706	---	---	---	---
Brangus	463	---	505	531	---	---	---	---	549	639	---	---	---	---
Single Crosses														
Ang. X Her.	---	---	---	---	---	371	383	388	---	---	---	616	640	534
Her. X Ang.	---	---	---	---	---	361	388	407	---	---	---	610	620	574
Ang. X Short.	---	---	---	---	---	---	314	364	---	---	---	---	559	515
Short. X Ang.	---	---	---	---	---	---	290	366	---	---	---	---	543	493
Her. X Short.	---	---	---	---	---	---	316	384	---	---	---	---	607	543
Short. X Her.	---	---	---	---	---	---	283	379	---	---	---	---	510	506
Ang. X Char.	---	---	---	---	370	---	---	---	---	---	649	---	---	---
Char. X Ang.	---	---	---	---	---	371	---	---	---	---	---	745	---	---
Char. X Her.	---	---	---	---	---	366	---	---	---	---	---	673	---	---
Her. X Char.	---	---	---	---	374	---	---	---	---	---	648	---	---	---
Brit. X Brit.	---	---	373	---	---	---	---	---	---	---	---	---	---	---
Brit. X Zebu	---	---	422	---	---	---	---	---	---	---	---	---	---	---
Brah. X Ang.	---	---	---	460	---	---	---	---	---	666	---	---	---	---
Char. X Brit.	---	---	406	---	---	---	---	---	---	---	---	---	---	---
Char. X Zebu	---	---	422	---	---	---	---	---	---	---	---	---	---	---
Back Crosses														
Brit., no Brah.	---	---	425	---	---	---	---	---	---	---	---	---	---	---
3/4 Brit., 1/4 Brah.	---	---	405	---	---	---	---	---	---	---	---	---	---	---
3/4 Brah., 1/4 Brit.	---	---	532	---	---	---	---	---	---	---	---	---	---	---

[a]Summarized by Reynolds, 1972.

[b]October to May = High: fed to gain 1 lb. daily;
Low : fed to gain 0.5 lb. daily.

Effects of Nutrition On Puberty

Workers at the former Fort Robinson Beef Research Station in Nebraska conducted a study of the effects of feed level on age at puberty in straightbred and crossbred heifers. The study involved straightbred Hereford and Angus heifers and crossbred heifers resulting from reciprocal matings of these two breeds. All heifers were assigned to the study at weaning at approximately 140 days of age. Breed groups were divided equally between a high and low nutrition plane. The high level ration consisted of self-feeding a ration consisting of 40 percent corn, 20 percent beet pulp, and 40 percent oats. In addition, these heifers received all the grass hay they would eat. The low level ration consisted of one pound of 40 percent protein cake plus full fed grass hay. A sterile bull was run with the heifers to determine estrous and heat checks were made daily. Results are shown in Table 5.

TABLE 5. OCCURRENCE OF FIRST HEAT IN HEIFERS ON TWO LEVELS OF FEED

Feed level	Breed	No. of heifers	Approx. daily gain	Percent in heat by: 11 mo.	12 mo.	13 mo.	14 mo.	15 mo.	16 mo.	17 mo.
Low	Angus	12	0.9	0	0	0	33	82	90	100
	Hereford	9	0.6	0	11	22	33	38	50	100
	Crossbred	17	1.0	0	0	12	68	85	100	100
High	Angus	12	1.6	8	33	58	100	100	100	100
	Hereford	8	1.3	0	12	50	100	100	100	100
	Crossbred	17	1.9	0	18	75	94	94	100	100

First, look at the weight gains on the two rations. The crossbreds gained the most rapidly on both the low and high rations, followed by the Angus, with the Herefords gaining the slowest. Now, look at the number of heifers in heat at the various ages. On the low level ration at 16 months of age, all the crossbreds, 90 percent of the Angus, and 50 percent of the Hereford heifers were in heat. By 17 months, all heifers had reached puberty, but it is interesting that the rank of puberty attainment follows closely the rank of weight gains; i.e., crossbreds first, Angus second, and Herefords third.

But, consider for a moment what it means to have only 30-80 percent of your heifers coming in heat at 15 months of age. For example, by projecting the figures from the low feed level, if these calves were born May 1, this would mean that by next May 1 (12 months of age) none of the Angus and crossbreds and only 11 percent of the Herefords were coming in heat. At 14 months or July 1, 68 percent of the crossbreds and 33 percent of the Hereford and Angus heifers were coming in heat. This is during the height of the breeding season! Not until 17 months were all heifers coming in heat and this would be the end of the breeding season for many ranchers!

Now, look at the number in heat on the high feed level. By 14 months of age, all the Angus and Hereford heifers had been in heat and only one crossbred had not exhibited estrous. In our previous example of a May 1 birth date, this means all the heifers except the one crossbred would have exhibited heat at least once by July 1, and each heat is a potential breeding and conception. Thus, our calf crop potential increases, and the calving season is advanced 2 to 3 months compared to the heifers wintered on the low ration level.

A study has been conducted at Miles City to determine the effects of winter weight gains on subsequent summer weight gains, puberty, and reproduction in crossbred heifers. The study involved 89 weaned, crossbred Angus-Hereford heifer calves assigned to one of three winter gain groups. Winter gain goals were 0.5, 1.0, and 1.5 and designated groups 1, 2, and 3, respectively. Heifers were held in feedlots during the 152-day wintering period starting December 5. Weight gains were controlled by adjusting feed levels as indicated necessary by group average weight changes. The wintering phase was terminated on May 6 when the heifers were placed on range forage adequate to sustain weight gains.

During the post-wintering or summer phase, all heifers were pastured together on range forage only. Estrous was determined by sterile bulls with marking harnesses and heifers exhibiting estrous were palpated to confirm ovulation. Breeding was by artificial insemination beginning June 15 and continuing to August 15. Results are summarized in Table 6.

TABLE 6. SUMMARY OF FEED EFFECTS ON HEIFER REPRODUCTION

Data	Data 1	2	3
No. head	30	29	30
Winter gain (lb./day)	0.6	1.0	1.5
Feed required (lb./day)[a]			
Hay	10.2	10.6	11.4
Grain[b]	--	1.9	4.4
Summer gain (lb./day)	1.3	1.2	0.9
Body wt. (lb.)			
End winter (5/6)	414	481	558
Begin breeding (6/15)	458	527	584
October (10/15)	629	667	708
Puberty age (days)	434	412	388
Percent in heat:			
Prior to breeding season	7	31	83
During breeding season	73	66	17
After breeding season	20	3	0
Percent bred and conceived:			
First 20 days	30	62	60
Second 20 days	10	21	20
Third 20 days	10	3	7
Not bred	20	3	0
October pregnancy (%)	50	86	87

[a]Calculated on weighted average basis.

[b]Ground grain mix: 70% barley; 12.5% linseed meal; 12.5% wheat bran; and 5% molasses.

Marked differences in weight gains during both winter and summer phases were obtained. These resulted in a difference of 79 pounds in October weights between Groups 1 and 3. But, look at the effects of winter gain on summer reproduction. Twenty percent of the heifers wintered at the low rate of gain failed to come in heat during the breeding season. This automatically reduces the maximum attainable calf crop to 80 percent. This is compared to a 97 percent and 100 percent maximum for the Group 2 or 3 heifers.

Let's break this down a little further. The Havre, Montana, data cited earlier shows clearly we want heifers to calve early if we are to make a good lifetime producer out of her. This means she must be in heat and conceive early in the breeding season. By looking at the percentages of heifers bred and conceiving during

the first, second, or third 20-day period, we can see another important effect of the winter feed level. Only 30 percent of the Group 1 heifers conceived during the first 20-day period. This is compared to 62 percent and 60 percent for heifers in Groups 2 and 3. The point clearly seen is that we can, in effect, condition the heifer to be either a good or poor lifetime producing cow simply by the way we feed or don't feed during the first winter as a weaned calf.

The October pregnancy percentages show the final effect of winter feed. Group 1 was 36 percent and 37 percent lower than Groups 2 or 3. This study should leave little doubt about the importance of adequate nutrition during the first winter period.

But, what happened to these heifers when they calved is also interesting. The results are summarized in Table 7. You will note that the heifers from the low feed level had smaller pelvic areas and more calving difficulty. This summary indicates an important point. Low levels of nutrition are not selective in what body component they effect. Delayed growth results in delayed development of the skeletal as well as the muscle and fat components of the body. In addition, it apparently takes a long time for a heifer to overcome the effects of delayed growth resulting from poor nutrition.

TABLE 7. EFFECTS OF REARING NUTRITION ON REPRODUCTION, PELVIC AREA, AND CALVING DIFFICULTY IN HEIFERS

Item	Winter gain group[a]	
	Low	High
No. heifers	30	59
Avg. daily gain - winter (lb.)[b]	0.6	1.3
Avg. daily gain - summer (lb.)[c]	1.3	1.0
October pregnancy (%)	50	86
Precalving pelvic area (cm^2)	240	252
Calving difficulty (%)	46	36

[a]All heifers handled the same after winter period.
[b]December 6 to May 6; see Table 6.
[c]May 7 to October 17.

Thus, a management decision must be made regarding the feed level for the replacement heifer. This feed level must be adequate to supply all the nutrients for growth and development but must not be excessive. If feed levels are too high, the heifer will become fat

and the problems associated with it such as lowered milk production, shortened productive lifespan, etc., will be encountered. In addition, the ration costs become prohibitive.

Feed levels should be decided on by establishing a target weight you want the heifer to weigh at the beginning of the breeding season. For example, data available suggest Charolais heifers should weigh a minimum of 750 lb. on this date. If you know the heifer weaning weights and the number of days from weaning until breeding, you can calculate the average daily gain required by dividing the weight necessary by the number of days from weaning until breeding. You can then formulate a management plan and a ration to give you that rate of gain. Use a scale to determine weaning weights and for following the weight gains the heifers are actually making. Use the cheapest feed available to meet the nutrient requirements and give the desired rate of gain.

An example of this plan for developing the replacement heifer is shown in Table 8. This example is based on the following assumptions: The heifer was weaned November 1 at 450 lb.; the winter period and pre-breeding period are 165 and 40 days duration, respectively.

TABLE 8. GAINS NEEDED TO REACH A 750 LB. BREEDING WEIGHT

	Winter (165 days) 11/1 to 4/15			Spring (40 days) 4/16 to 5/25	
11/1 wean wt.	A.D.G.	Total gain	End winter wt.	Total gain required	A.D.G. required
450 lb.	0.7	116	566	184	4.6
	1.0	165	615	135	3.4
	1.5	248	698	52	1.3

This management plan has other aspects. Recent work at Miles City has been conducted to determine the effects of separating heifers into heavy and light weight groups at weaning. The heifers were then fed to the same target weights. Results are summarized in Tables 9 and 10 showing an increase of 19 percent in light heifers cycling at the beginning of the breeding season. However, note that the heifers that were light at weaning required a greater investment in terms of feed and dollars to reach the target weight and still had a lower puberty and pregnancy percentage than the heifers that were heavy at weaning, regardless of the winter feed level.

TABLE 9. EFFECTS OF HEIFER MANAGEMENT ON WEIGHT CHANGES

	Fed together		Fed separate	
	Light heifers	Heavy heifers	Light heifers	Heavy heifers
No.	10	10	19	20
Weaning:				
Age	187	204	185	200
Weight	376	475	374	464
Daily gain:				
Projected	1.40	1.40	1.72	1.17
Actual	1.27	1.47	1.81	1.24
End winter wt.:				
Projected	650	650	650	650
Actual	587	717	675	671
Begin breeding wt. (6/15)	620	719	669	722
October wt.	794	904	807	862

TABLE 10. EFFECTS OF HEIFER MANAGEMENT ON PERFORMANCE

	Fed together		Fed separate	
	Light heifers	Heavy heifers	Light heifers	Heavy heifers
No.	10	10	19	20
Age at puberty	423	404	405	389
% cycling by 6/15	60	90	79	90
% preg. in Oct.	60	80	79	90
Pelvic area (Oct.)	215	235	217	229
Cannon bone length	22.5	24.0	22.3	23.6

Hormone Treatment

Recent research by reproductive physiologists has suggested puberty in beef heifers can be induced by hormonal treatments. A study has been completed at Miles City to determine effectiveness of 6 different hormonal treatments on puberty and fertility in heifers. The most successful treatment involved placing a progestogen implant under the skin of the ear and leaving it in place for 9 days. In addition, each heifer received an injection containing an estrogen plus a progestogen on the day the implant was inserted. Results of the most successful treatment are summarized in Table 11; and it can be seen that following a 45-day breeding season, the pregnancy rate of the puberal heifers was 75 percent and that of the treated heifers was 77 percent. Thus, producers have an additional

management tool that can be considered for establishing pregnancy in yearling heifers. It should be pointed out, however, that continued use of treatments of this kind could have indirect effects on the genetic potential for spontaneous puberty.

TABLE 11. INDUCED-SYNCHRONIZED PUBERTY IN HEIFERS

Treatment	No. heifers	Heifers in heat		Heifers pregnant	
		0-4 days (%)	0-45 days (%)	0-4 days (%)	0-45 days (%)
Puberal controls	84	87[a]	96	56[a]	75
Hormone treated	26	88	96	54	77

[a]Values are for first 22 days of breeding season.

Many producers are using zeranol (Ralgro®) to stimulate weight gains in calves prior to weaning. Others are using this compound to increase growth rate in calves following weaning. We have recently completed two studies involving 206 head designed to determine the effect of zeranol on puberty and subsequent fertility in heifers. Heifers were given a 36 mg zeranol implant at the start of the winter feeding period and again 84 days later in Experiment 1 and 87 days later in Experiment 2. Results are summarized in Table 12.

TABLE 12. EFFECTS OF ZERANOL ON REPLACEMENT BEEF HEIFERS[a]

Data	Experiment 1		Experiment 2	
	Control	Zeranol	Control	Zeranol
Initial wt. (lb.)	435	435	523	528
Final wt. (lb.)	648	672	733	753
ADG on test (lb./day)	1.0	1.2*	1.4	1.5**
Final pelvic area (sq. cm)	158	176*	163	176**
Non-ovulatory estrous (%)	35	74	34	42
Puberty by beginning breeding season (%)	78	69	98	98
October pregnancy (%)	78	63	87	89

[a]Total of 206 heifers.
*P<.01.
**P<.05.

It can be seen that the heifers implanted with zeranol grew more rapidly than the control heifers. It is interesting to note that the increased growth was also reflected in larger pelvic areas which is a measure of skeletal growth and size. Experiment 1 showed definite negative effects on pregnancy rate while no effect was noted in Experiment 2. These results are not conclusive, but notice the difference in rate of gain on the two studies. It could be suggested that if plane of nutrition is limiting, zeranol treatment may result in detrimental effects on subsequent reproduction in heifers. These results indicate the need for additional studies and the need for caution in recommendations for use of this compound in replacement heifers.

ooOoo

BULL MANAGEMENT

INTRODUCTION

There has been a recent re-kindling of interest in the reproductive performance of the bull. This has partly occurred through new technology, such as differential interference phase microscopy which has helped usher in a new era in spermatozoal morphology assessment. Interest has also grown in less definitive aspects of reproductive performance such as the sexual and social behavior of beef bulls. Recent work in the latter areas has capitalized on earlier work with dairy bulls which illustrated the importance, measurability, and strong genetic control of sex-drive in bulls (Bane 1954; Almquist and Hale 1956; Hültnas 1959).

Bulls vary a great deal in their reproductive capabilities. Apart from disease or injury, this variation is due to one or more of three factors:

1. Semen quality and/or quantity.
2. Sex-drive (libido) and mating ability.
3. Social interactions between bulls in multi-sire breeding programs.

SEMEN QUALITY AND/OR QUANTITY

Fertility in the male is the result of a complex interaction of different factors of which seminal quality is but one. Consequently, the difficulty encountered in trying to predict fertility from a single seminal characteristic (or even ejaculate) is not surprising. Various scoring systems, employing a number of criteria, have been devised to aid in fertility prognosis in bulls (Lagerlöf 1936; Sluis 1961; Carroll, et.al. 1963; Society for Theriogenology 1976). Carrol, et.al. (1963) assessed 10,940 bulls and found 85.1% to be satisfactory, 10.7% questionable, and 4.2% unsatisfactory. Wiltbank, et.al. (1965) used similar assessment procedures to determine the relationships between seminal quality assessments in bulls (spermatozoal motility and morphology) and their subsequent reproductive performance when naturally mated. These authors determined that the average fertility of a group of bulls could be predicted with some accuracy, but the prediction of individual bull

Presented by Peter J. Chenoweth, Assoc Professor (Theriogenology), Dept of Large Animal Medicine and Surgery, Texas A&M Univ, College Station, TX, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

fertility was subject to error. In this study, spermatozoal morphology had the best predictive value for fertility; while in another study, (Bartee, et.al. 1961), it was shown that spermatozoal motility had the closest relationship with percent calf crop.

Recently, the Society for Theriogenology revised their breeding soundness examination (B.S.E.) criteria for bulls. This resulted in emphasis being placed on scrotal circumference and spermatozoal morphology assessments, with spermatozoal motility being of lessened importance in the final score. Scrotal circumference, testis size, and spermatozoal production are highly correlated, especially in young bulls (Hahn, et.al. 1969; Coulter 1978). The heritability of scrotal circumference in Holstein bulls was estimated as 0.67 (Coulter, et.al. 1976), and a similar estimation (0.68) has been made in young beef bulls (Coulter and Keller, unpublished data). In addition, it has been shown that scrotal circumference in young bulls is favorably related to seminal quality measures such as the incidence of spermatozoal abnormalities (Brinks 1977).

It was apparent that the revised assessment procedures needed to be tested against the actual reproductive performance of bulls. Estrus synchronization provided a tool to do this. Bulls could be assessed, placed with different numbers of synchronized females, and be continuously observed through the mating period. In addition, with the aid of accurate palpation 30-60 days after the trials, assessment results could be related to the pregnancy rates achieved by the bulls during the trial period. We have results on 8 trials in 1976 and 1977 involving 43 bulls and 1,032 females.

Prior to each trial, 31 bulls received a breeding soundness examination (BSE), and a final score was calculated by the system recommended by the Society for Theriogenology (1976). This examination included palpation of the reproductive organs, evaluation of seminal characteristics, and measurement of scrotal circumference. In addition, each bull was given two tests for libido and serving capacity (Chenoweth, et.al. 1977).

The heifers which were to be synchronized were treated with a 9-day ear implant regime (Syncro-Mate-B*). Approximately 27 hours after the implants were removed, bulls were placed with heifers and observed continuously for the next 30-42 hours. All mounts, services, and abnormal behavior exhibited by the bulls were recorded. Care was taken not to interfere with normal mating activity. Observations were mostly conducted in pens. Each bull remained with the original group of heifers with which he was placed

*Supplied by G.D. Searle and Company.

for at least 96 hours. BFR's (bull to female ratios) tested with synchronized heifers: 1:10, 1:15, 1:20, 1:25, 1:30, 1:35, and 2:40. Synchronization and service rates are shown in Table 1.

TABLE 1. SYNCHRONIZATION[a] AND SERVICE RATES IN TREATED FEMALES IN NATURAL BREEDING PERIOD (30 hrs. or 42 hrs.)

Trial No.	No. of Heifers	No. (%) Exhibiting Estrus	No. (%) Serviced of Those in Estrus
1	50	44 (88.0)	
2	50	48 (96.0)	38 (83.3)
3	50	47 (94.0)	44 (93.6)
4	50	49 (98.0)	39 (79.6)
5	100	92 (92.9)	63 (68.5)
6	80	73 (91.3)	62 (84.9)
7	111	107 (99.1)	92 (86.0)
8	273	265 (97.1)	183 (76.5)
Total	764	725 (94.9)	521 (76.5)

[a]Slight discrepancies in numbers due to deaths, missing animals, etc.

Approximately 95% of all treated females were observed exhibiting estrus during the synchronized period (Table 1). The bulls serviced an average 76.5% (33.3% to 100.0%) of those heifers observed in estrus. The overall pregnancy rate for those females observed to be serviced was 49.1% (34.9% to 78.9%). The overall proportion of heifers that became pregnant by individual bulls ranged from 5.5% to 100%.

Significant correlations ($P<.05$) were observed between the pregnancy rates achieved by bulls and their scrotal circumference, spermatozoal motility, and abnormal morphology ($r=.58$, .47, and -.40, respectively). (Table 2)

TABLE 2. CORRELATIONS BETWEEN BULL B.S.E. VALUES AND PREGNANCY RATES ACHIEVED WITH SYNCHRONIZED FEMALES IN 30- OR 42-HOUR PERIOD

Category	Correlation (r) with pregnancy rate
B.S.E. Score	.33
Scrotal Circumference	.58*
Percent (%) Motility	.47*
Rate of Motility	.38
Primary Abnormalities	-.12
Secondary Abnormalities	-.37
Total Abnormalities	-.40*

*$P<.05$.

Pregnancy rates achieved by bulls of questionable or satisfactory BSE categories are shown in Table 3. The difference was not significant.

TABLE 3. PREGNANCY RATES IN SYNCHRONIZED FEMALES SERVICED BY BULLS OF QUESTIONABLE OR SATISFACTORY B.S.E. CATEGORIES IN 30-HOUR BREEDING PERIOD

B.S.E. Category & Range of Scores	Number of Bulls*	Percent Females Pregnant
Questionable (44-58)	8	43.15
Satisfactory (60-100)	17	53.62

*Bulls used in 2:40 B.F.R.'s not represented.

These results indicated that our assessment procedures were of value in predicting the breeding potential of bulls. The three criteria (scrotal circumference, spermatozoal motility, and spermatozoal morphology) employed in the revised scoring system adopted by the Society for Theriogenology in 1976 were significantly correlated with the pregnancy rates achieved by bulls in natural service under stressed conditions. Although the overall B.S.E. score was not found to be significantly correlated with pregnancy rate, a closer relationship may have been found with a greater number of bulls with a wider spectrum of B.S.E. scores than those obtained by the bulls in this study (range 44-100). However, it is considered that greater accuracy in bull assessment would be achieved if the B.S.E. scoring system is not used as a quantitative prediction of bull reproductive performance, but rather as an aid to place bulls in satisfactory, questionable, or unsatisfactory prospective breeder categories.

Similar conclusions were reached in a study involving 40 young (22-24 month) Santa Gertrudis bulls mated with 1,000 2-year-old Santa Gertrudis heifers in Southern Texas (Morris, et.al. 1978). Here, individual bulls were placed with 100 heifers in a pen for a 4-day period. Twice daily heat-checking and chin-ball markers using different colors for each bull were employed. A rest period of one day was used between bulls and pregnancy rates were established by rectal palpation 35-60 days post-mating. In this study:

1. Bulls with a B.S.E. score higher than 70 achieved significantly higher pregnancy rates than bulls scoring less than 70.

2. Scrotal circumference was not significantly related to pregnancy rate.

3. Percent normal spermatozoa was significantly positively correlated with pregnancy rate.

4. Percent 'secondary' spermatozoal abnormalities was significantly negatively correlated with pregnancy rate.

5. Libido was not related to scrotal circumference or 'masculinity' score.

A word of caution should be inserted here concerning scrotal circumference measurements. Much of the available data is from dairy bulls or European-type beef bulls raised under good conditions. Cates (1975) showed that relatively minor changes in nutrition can have a marked effect on scrotal circumference measurements in 2-year-old bulls. He stressed that levels of feeding and management should be considered when bulls of this age group are assessed. Coulter (1978) demonstrated differing growth relationships with scrotal circumference development in different breeds of beef bulls. Results from several areas in the U.S. give varying accounts of scrotal circumference development in Brahman bulls. In Texas, Morris, et.al. (1978) concluded that scrotal circumference development in the Brahman bull post-puberally was approximately 12 months behind that in the European breeds and that equivalence was not achieved until the Brahman bulls were about 3 years of age. However, a Florida study (Cornelisse 1978), with a smaller number of bulls, indicated that Angus and Brahman bulls developed in scrotal circumference at a rate which was not markedly different. These two studies illustrate the wide variations within the Brahman group, and the possibility for rapid improvement of reproductive factors by selection.

Finally, in this discussion of the value of BSE components in bull assessment, mention should be made of an important genetic consideration. Brinks, et.al. (1978) reported significant favorable estimated correlations between age at puberty in heifers and some B.S.E. components in their half-sib brothers. (Table 4).

TABLE 4. ESTIMATED GENETIC CORRELATIONS BETWEEN REPRODUCTIVE TRAITS IN BULLS WITH PUBERTY AGE IN HALF-SIB HEIFERS

	Bull Traits				
Heifers	Scrotal Circ.	% Normal Sperm	% Primary Abnorm. Sperm	% Second. Abnorm. Sperm	Motility
Age at puberty	-.71	-.37	.36	.09	.33

This would seem to indicate that young bulls with above average scrotal circumference and spermatozoal morphology should produce heifers with an earlier inherent age at puberty.

SEX-DRIVE (LIBIDO) & MATING ABILITY

Table 5 shows the estrus detection and pregnancy rates achieved by bulls employed at different bull to female ratios (BFR's) in 21-day natural breeding trials at Nunn, Colorado (Rupp, et.al. 1977). In general, single bull breeding pastures were as efficient as multi-bull pastures in estrus detection. This was also true of pregnancy rates except for two single bull pastures where they were significantly depressed. As all bulls used in these trials had passed a breeding soundness exam, these depressed results were considered to reflect deficiencies in bull libido and/or mating ability.

TABLE 5. SINGLE AND MULTIPLE SIRE BREEDING TRIALS 21-DAY BREEDING SEASON

Bull to Female Ratio	4:99	4:101	1:44	1:44	1:43	2:89	1:60	1:60	1:60	1:60
% Heats Detected	97	95	95	98	88	96	92	98	95	98
% Pregnancies	78	70	64	73	19	62	40	72	63	68

Although beef bulls are often given a breeding soundness examination prior to use, other aspects of reproductive performance are seldom considered. This is particularly true of the assessment of libido and mating ability. Blockey (1975) illustrated the importance of including such an assessment when he submitted 548 bulls to both a normal B.S.E. and to a serving capacity test (which he devised). He found 113 bulls unsound for breeding as shown in Table 6. Of these, 31 were detected as having clinical signs of abnormalities only when they served or attempted to serve in the serving capacity test. The abnormalities diagnosed included penile deviations, penis-prepuce adhesions, spondylosis deformans, and joint diseases. An additional 17 bulls were culled on the basis of poor serving capacity. This resulted in 48 bulls which would have probably passed a normal B.S.E. being eliminated from the breeding program as poor prospective breeders.

TABLE 6. BREEDING SOUNDNESS EXAMINATION AND SERVING CAPACITY TEST OF 548 BEEF BULLS; REASONS FOR REJECTION AS POOR POTENTIAL BREEDERS (Blockey 1975)

	Culled (total)	Physical exam.	Semen exam.	Serving capacity exam.
Locomotor abnormalities	54	38	--	16
Genital abnormalities	42	24	3	15
Poor serving capacity	17	--	--	17
Total	113	62 (55%)	3	48 (43%)

Over the past 3 years, yearling beef bulls at the San Juan Basin Research Center, Colorado, have been studied to further define sex-drive relationships. Some conclusions from this work are:

1. Sex Drive Varies Considerably Between Different Lines of Bulls (Chenoweth, et.al. 1977). This agrees with other work showing that sex drive in bulls is largely under genetic control.

2. There Is Very Little Relationship Between Measures of Sex Drive and Measures of Semen Quality and Quantity (Blockey 1975; Chenoweth, et.al. 1977). In other words, a bull with high sex drive may have low or poor sperm production and vice versa. Both factors should be assessed separately for optimal assessment of the breeding potential of bulls.

3. A Single Measurement of Testosterone of L.H. in Peripheral Blood Is of Little Value in Predicting Sex Drive in Bulls (Chenoweth, et.al. 1977).

In the synchronization trials employing bulls reported earlier in this report, bulls were pre-assessed for libido and serving capacity (as well as being given a breeding soundness examination) prior to the trials. During the continuous observation periods (30 hours or 42 hours), data was recorded on:

1. Number of mounts and services by each bull.
2. Times of mounts and services.
3. Identity of females mounted and served.

A summary of the sex-drive measure relationships with these data is shown in Table 7.

TABLE 7. CORRELATIONS BETWEEN MEASURES OF SEX-DRIVE IN BULLS AND PERFORMANCE IN 30- OR 42-HOUR BREEDING PERIODS WITH SYNCHRONIZED FEMALES

Sexual Performance in 30 or 42 Hours	Correlations (r) with sex-drive measures	
	Libido score	Serving capacity score
Number of services	.48	.47
No. of females served	.45	.40
Mount to service ration	-.33	-.37
Time to 50% of services ($T_{\frac{1}{2}}$)	.08	.19
Females pregnant of those available	.09	.09

None of the libido or serving capacity scores (a first, second, mean, or best score) was significantly correlated with the pregnancy rates achieved by the bulls during the trial period (Table 7). The use of bulls with a greater variation in sex drive may have shown more relationship between measures of this trait and pregnancy rates. Sex drive measures were, however, significantly related to the sexual performance of bulls during the trial periods. Both mean libido and mean serving capacity scores were correlated ($P<.05$) with the number of services achieved and the number of females serviced.

SOCIAL INTERACTIONS

Social ranking of bulls can influence their sexual activity when they are mated in groups. This was well illustrated in the data of Osterhoff (unpublished, cited by Blockey, 1975). This author blood-typed the calves born to cows mated as a herd to 3 or 4 bulls and followed these results for 5 consecutive years. These data (Table 8) showed that the oldest or second oldest bull in the group sired 60% or more of the calves each year, while the youngest bull sired 15% or fewer. As social ranking in bulls is largely controlled by age and seniority within groups (Blockey 1975), it is reasonable to assume these results reflect the influence of social ranking on the reproductive capabilities of the bulls.

TABLE 8. REPRODUCTIVE PERFORMANCE OF 3 OR 4 BULLS JOINED TO A GROUP OF COWS OVER A 5-YEAR PERIOD

Bulls used	Percentage of calves sired by each bull				
	1964	1965	1966	1967	1968
Oubaas	70.4 (10)+	76.0 (11)	12.2 (12)	0*	0*
Matie	16.7 (4)	18.0 (5)	63.4 (6)	72.5 (7)	25.1 (8)
Morena	7.4 (3)	6.0 (4)	12.2 (5)	12.5 (6)	62.5 (7)
Slinger	5.5 (2)	0* (3)	12.2 (4)	15.0 (5)	12.4 (6)

(Osterhoff, cited by Blockey, 1975)
*Bulls absent from the herd.
+Age of bull in years.

Rupp, et.al. (1977) compared estrus detection and pregnancy rates in natural breeding trials employing bulls and heifers at single and multi-sire BFR's of 1:25, 1:44, and 1:60 (Ref. Table 5).

In multiple-sire mating, 70% plus of the heifers were bred by more than one bull at any given estrus. This inefficient breeding overlap was just as great in pastures employing two bulls as in pastures employing four bulls. Heifers marked by more than one bull did not have better pregnancy rates than those bred by a single bull. Social ranking among bulls affected the number of heifers mated by each bull. In these trials, the fertility, libido, and mating ability of individual bulls were the most important factors in determining pregnancy rates. This provides further incentive to efforts to develop methods of accurately assessing these factors in bulls prior to the breeding season.

Although this study (and others) have shown that dominant bulls sire more offspring or achieve more services than subordinate ones when they are placed together in groups with the cow herd, it is not known if the relative success achieved by the dominant bulls is due to a higher degree of fertility and/or sex drive than the subordinate bulls or due to other facts. Preliminary studies with yearling bulls at the San Juan Basin Research Center (Ologun, et.al. 1978) gave some indication that:

1. There may be an inverse relationship between dominance (assessed as dominance value) and sex drive measures.

2. There may be an inverse relationship between performance test results (average daily gain and final test weight) and sex drive measures.

ooOoo

ACKNOWLEDGEMENTS

Grateful acknowledgement is given to Drs. Brinks, Pexton, and Rupp for their contributions to these studies. Data are included from the M.S. theses of Eugen R. Mateos and Adesui G. Ologun. The assistance of faculty, staff, and graduate students of The Animal Reproduction Laboratory, Colorado State University, is also acknowledged with gratitude. This work was partially supported by a Biomedical Research Support Grant (H.E.W.).

REFERENCES

Almquist, J.O. and Hale, E.B. (1956). Proc. 3rd Int. Congr. Anim. Reprod., Cambridge. Plenary papers: 50.

Bane, A. (1954). Acta. Agric. Scand. 4: 95.

Bartee, J., Brown, C.J., and Peterson, H.P. (1961). Arkansas Farm Research. X: 4.

Blockey, M.A. de B. (1975). "Studies on the Social and Sexual Behavior of Bulls." Ph.D. Thesis, Univ of Melbourne, Victoria.

Brinks, J.S. (1977). Proc. Beef Improvement Federation Symposium. May 16-18, Bozeman, Montana.

Brinks, J.S., McInerney, M.J., and Chenoweth, P.J. (1978). Relationship of Age at Puberty in Heifers to Reproductive Traits in Young Bulls. Abst., Proc. Ann. Meet. Amer. Soc. for Animal Science, West. Sect.: Pomona, California, June 14-16.

Carroll, E.J., Ball, L., and Scott, J.A. (1963). J. Am. Vet. Med. Assn.: 142, 1105.

Cates, W.F. (1975). Proc. Ann. Meet. Soc. for Theriogenology, Cheyenne, Wyoming.

Chenoweth, P.J., Abbitt, B., McInerney, M.J., and Brinks, J.S. (1977). Col. State Univ. Expt. Sta., Gen. Series 966.

Cornelisse, K.W. (1978). Factors Affecting Puberty in Brahman and Angus Bulls and Heifers. M.S. Thesis. Univ of Florida.

Coulter, G.H., Rounsaville, P.R., and Foote, R.H. (1976). J. Anim. Sci. 43: 9.

Coulter, G.H. (1978). Proc. Ann. Meet. Soc. for Theriogenology, Oklahoma City, Oklahoma.

Hahn, J., Foote, R.H., and Seidel, G.E., Jr. (1969). J. Anim. Sci., 29, 41-47.

Hültnas, C.A. (1959). Acta. Agric. Scand., suppl. 6: 1-82.

Laferlöf, N. (1936). Vet. Record. 48: 41, 1159-1170.

Morris D.L., Smith, M.F., Parish, N.R., Williams, J.D., and Wiltbank, J.H. (1978). Proc. Ann. Meet. Soc. for Theriogenology, Oklahoma City, Oklahoma.

Ologun A.G., Chenoweth, P.J., Davis, M.E., and Brinks, J.S. (1978). Col. State Univ. Expt. Sta., Gen. Series 973.

Rupp, G.P., Ball, L., Shopp, M.C., and Chenoweth, P.J. (1977). J. Am. Vet. Med. Assn. 171:7, 639-642.

Sluis, L. van der. (1961). Proc. 4th Intl. Congr. Animal Reprod., The Hague, 1, 116.

Society for Theriogenology (1976). A Compilation of Current Information on Breeding Soundness Evaluation and Related Subjects, Journal Vol. VII, 2nd Edition.

Wiltbank, J.H., Rowden, W.W., and Ingalls, J.E. (1965). University of Nebraska, Res. Bull. No. 224.

BEEF HERD HEALTH PROGRAM

A herd health program for any of the phases of the cattle business must be centered around the prevention of diseases rather than the treatment of diseases. This does not decrease the importance of the observation and treatment of any animals that become sick, but preventive rather than therapeutic medicine is the key.

All health programs should be developed with the advice of the herd owner's veterinarian. The veterinarian is trained in livestock disease control and is the person most aware of the problems in the area. Therefore, a veterinarian's advice and consultation should be secured when setting up a health program. It is also important to realize that no program will be successful without cooperation between the owner, herdsman, veterinarian, and any others who might be involved.

Basic Principles of a Herd Health Program

1. Prevent exposure of animals to disease-producing organisms and situations through the:

    a. Practice of good sanitation and cleanliness.

    b. Isolation of newly acquired animals for 10 days to 3 weeks.

    c. Maintenance of a good environment.

    d. Eradication of diseases when possible.

2. Maintain a high level of resistance in the animal population by:

    a. Utilizing proper nutrition--feed, water, minerals, and vitamins.

    b. Utilizing vaccination--immunization procedures that are available.

    c. The selection of sound animals.

3. If a disease occurs, prevent its spread through the:

    a. Isolation of sick animals.

Presented by Thomas L. Bibb, D.V.M., Assoc Professor, Dept of Veterinary Science, Virginia Polytechnic Institute & State Univ, Blacksburg, VA, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

b. Securing of a diagnosis early--physical examination and/or autopsy by a veterinarian.

c. Close observation of the herd.

d. Application of treatment based on the diagnosis.

Cow-Calf Operation

A. Breeding herd (cows, bulls, replacement heifers)

1. Fertility test bulls prior to the breeding season.

2. Vaccinate for leptospirosis (3 strains--pomona, hardjo, grippotyphosa), IBR, BVD, PI3, and vibriosis, prior to beginning of breeding season and while females are open (not pregnant).

3. Treat for internal parasites (worms) at least twice a year --more frequently, if necessary.

4. Practice good external parasite control procedures; treat for grubs and lice--follow recommendations on products available.

5. Examine all females for pregnancy after the conclusion of the breeding season and cull open cows.

6. Isolate all new additions to the herd and test for brucellosis, tuberculosis, and anaplasmosis.

B. Calving time

1. Observe cows closely at calving time.

2. Remember the pasture is probably the best calving area.

3. Keep animals due to calve soon in an area where handling facilities are available.

4. Have your veterinarian instruct you on how you should handle maternity cases, what equipment and medication you need, and when you should seek professional help.

5. First-calf heifers usually are going to have more trouble than older animals and will need closer observation and more assistance.

C. Calves

1. Dip the navel cords on all new-born calves with a disinfectant such as strong (7 percent) tincture of iodine.

2. Make sure calves nurse and get colostrum (cow's first milk) within 2 hours of birth. Keep some colostrum frozen for emergencies and have some form of an esophageal feeder available for use on weak calves.

3. Inject new born calves with vitamin A and D during the first few days of life.

4. Identify calves soon after birth.

5. Castrate and dehorn calves at an early age. It is easier and fewer problems occur when done early. (Use caustic dehorning material--paste or liquid.)

6. Vaccinate all calves against Clostridium chauvoei and C. septicum (blackleg and malignant edema) during the first 2 months. It is important to repeat this at 6-8 months of age.

7. Check with your veterinarian about the use of vaccines for other clostridial diseases and for calf scours (Reo-Corona Virus) in your herd.

8. Vaccinate all replacement heifers between 2-6 months of age against brucellosis (Bangs).

9. Routine vaccination for IBR-BVD-PI3 should be done 2-3 weeks prior to weaning or 2-3 weeks after weaning but usually not at weaning because of stress present at that time.

10. Treat for grubs and lice in the fall. Read and follow directions on product labels.

11. Treat for internal parasites on a routine basis - usually before weaning, but more frequently if needed.

12. Eye problems--first obtain a diagnosis and then follow the veterinarian's advice as to treatment and possible preventive measures. Good fly control and close observation, so that proper treatment may be given early, are two things that will greatly reduce losses.

D. Several Herd Health Practices

1. Provide good basic nutrition.

2. Provide adequate salt and minerals, including magnesium.

3. Supply vitamins A and D through the feed or by injection.

4. Check with your veterinarian on the need for selenium--vitamin E preparations in the area and on your farm.

5. Keep feet trimmed and corns removed from animals, especially bulls. Get this work done before breeding season.

6. If artificial insemination is used and teaser bulls are a part of the program, make sure the teaser has had his penis removed, blocked, or deviated.

An explanation of the diseases mentioned previously may help you understand the reasons for preventing these conditions.

1. Brucellosis. This is a bacterial disease, commonly referred to as "Bangs," that affects several species of animals, including cattle and man. It affects cattle primarily by causing abortions. There are Federal-State programs for the eradication of this disease because of animal losses and the human health hazard. There is no treatment in animals, but it can be prevented by vaccinating heifer calves between 2-6 months of age.

2. Leptospirosis. "Lepto" is a bacterial disease of cattle caused by the organism Leptospira. There are 3 strains--hardjo, pomona, and grippotyphosa--that are primarily involved and animals should be routinely immunized against these. Two other strains--canicola and icterohemorrhagiae--may become important in certain herds. These diseases cause abortions, infertility, weak calves, systemic infections, and death in some animals.

3. Vibriosis. This is considered to be a veneral disease and is spread, at the time of breeding, from an infected male to the females or from an infected female to the male and then to the rest of the herd. It causes abortions and infertility in the female. Treatment is difficult and prevention is by annual vaccination of breeding animals or by the use of artificial insemination.

4. IBR. Infectious bovine rhinotracheitis (IBR) is a viral disease that may cause respiratory infections, encephalitis

(brain infection), conjunctivitis, abortion, and reproductive tract infections. It is prevented by use of vaccines. There are modified live virus (MLV) products for intranasal (IN) or intramuscular (IM) use and killed virus products for intramuscular (IM) use. Do not use any of these products unless you have discussed the precautions regarding their use with a veterinarian.

5. PI-3. Parainfluenze type 3 (PI-3) is a viral disease causing primarily respiratory problems in cattle. It is considered to be a secondary factor in many "Shipping fever" outbreaks. There are also MLV - IN and IM products and killed virus products for use in immunization programs.

6. BVD. Bovine virus diarrhea (BVD) affects cattle by causing abortions, diarrhea, chronic digestive disturbances, weak calves at birth, fetal anomalies, conjunctivitis, dermatitis, and nervous signs. The only vaccines available are MLV products for IM use. Do not use these products without discussing their use with a veterinarian.

7. Blackleg--Malignant Edema. These are diseases caused by the organisms Clostridium chauvoei and C. septicum. These are organisms that live in the ground and may enter a calf through wounds, ingestion, and navel cords. These organisms produce substances (toxins) in the animal's body that are rapidly fatal. Prevention is by the use of a vaccine (bacterin--killed bacteria) in the young animal. Repeated doses are indicated.

8. Grass Tetany. Grass tetany or winter tetany is a condition caused by a deficiency of the mineral "magnesium (Mg)" in the animal's body. It can cause tetany (convulsions), paralysis, blindness, and sudden death. It is treatable if caught early, but prevention is more successful. It is prevented by the addition of MG to the animal's diet on a daily basis. This can be done on a seasonal or year-round basis. Herds in areas where it is a problem should probably supplement year-round. Discuss the methods and materials to use with your Extension Agent or feed dealer.

Herd Health Calendar

Any type of a health program has certain procedures, vaccinations, and management decisions that must be performed at a given time. An attempt has been made to put a year-round health schedule together incorporating some things that are considered to be important in getting the most number of cows bred, pregnant, and

calved successfully and the greatest number and pounds of calf to weaning time. The schedule included uses the following premises in arriving at dates:

1. 80-day calving season for cows.
   60-day calving season for heifers.

2. Spring calving season.

3. 285-day gestation period (length of pregnancy).

4. Heifers start calving 30 days prior to cows.

Use the work column at the right to select health management dates for your herd. Then put these dates on your calendar.

		Your Herd
Move heifers into calving pasture	Dec 15	_____
Begin calving heifers--60-day season	Jan 1-Mar 2	_____
Move cows into calving pasture and sort heavy cows weekly	Jan 15	_____
Begin calving cows--80-day season	Feb 1-Apr 22	_____
Calves: Identify, disinfect navel cord, give Vitamin A-D, vaccinate for blackleg-malignant edema, castrate, and dehorn (may use caustic)	As born	_____
Fertility test bulls (prior to breeding season)	Feb 15	_____
Vaccinate bulls--leptospirosis (3 strains), IBR, BVD, PI-3, vibriosis, and treat for internal parasites (worm)	Feb 15	_____
Replacement heifers (those to be bred for first time): Vaccinate against leptospirosis (3 strains), IBR, BVD, PI-3, and vibriosis, and treat for internal parasites (worm)--do these things at least 2-3 weeks prior to breeding	Mar 1	_____
Start breeding heifers	Mar 24	_____

		Your Herd
Stop breeding heifers--remove bulls	May 23	_____
Cow Herd: Vaccinate open cows and 1st calf heifers for leptospirosis (3 strains), IBR, BVD, PI-3, vibriosis and treat for internal parasites (worm) - do these things at least 2-3 weeks prior to breeding	Apr 5	_____
Start breeding cows	Apr 24	_____
Stop breeding cows - remove bulls	Jul 13	_____
Calves: Re-vaccinate for blackleg-malignant edema; castrate and dehorn any missed earlier; brucellosis vaccinate heifers (2-6 months of age)	Jun 1-Jul 1	_____
Pregnancy exam heifers	Jul 24	_____
Pregnancy exam cows	Sept 13 to weaning	_____
Treat cows and replacement heifers for internal parasites, grubs, and lice. This can be done while pregnancy checking.	Sept 13 & before Nov 1	_____
Calves: Worm, treat for grubs and lice	Oct 1	_____
Re-vaccinate for blackleg-malignant edema (prior to sales)	Oct 1	_____
Vaccinate for IBR-PI-3 (Nasal vaccine)	Oct 1	_____
(If modified live virus (MLV) intramuscular (IM) vaccine is used, do after weaning)	Nov 15	_____
Wean calves	Oct 15-Nov 15	_____
Start magnesium supplementation for cows (May consider year-round supp.)	Oct 15-Nov 1	_____
Late gestation heifers--vitamin A-D and treat for lice	Dec 15	_____
Late gestation cows--vitamin A-D and treat for lice	Jan 15	_____

Stocker-Feeder Program

I. HOME RAISED ANIMALS

1. Vaccinate prior to weaning for IBR-BVD-PI3 and pasturella. Re-vaccinate after weaning for pasturella.

2. Worm calves prior to weaning and again 2-3 months later.

3. Treat for grubs and lice--repeat lice treatment at least once and preferably twice during winter.

4. Inject calves with vitamins A and D and make sure adequate amounts are available in feed supplies.

5. Feed adequate mineral, including magnesium.

6. Implant if it is recommended.

II. PURCHASED ANIMALS

If possible, buy preconditioned animals or animals where background is known. When possible, move directly from farm of origin to your farm.

The following will apply to animals from sales, and those with unknown histories. Do these procedures on arrival or wait 3 weeks:

1. Vaccinate for IBR-PI3.

2. Worm for internal parasites.

3. Treat for grubs and lice--repeat during winter.

4. Vaccinate for blackleg-malignant edema and any other Clostridial diseases that your veterinarian recommends.

5. Implant.

6. Vaccinate for BVD after animals are well adjusted.

III. RESPIRATORY PROBLEMS

1. Complex problems which may involve many factors: stress, bacteria, viruses, nutrition.

2. Good immunization programs will reduce losses.

3. Reduce stress on animals--hauling, feeding, handling, environment.

4. Important to get a good diagnosis before starting on any treatment program.

5. Treatment must be with effective drugs administered in therapeutic amounts for prescribed period of time. Long-acting, sustained-release products have a place in the treatment of the respiratory complex by reducing stress of daily handling.

6. Close, keen observation of animals for the early detection of sickness is one of the most important factors contributing to a successful treatment program.

ooOoo

[illegible]
treatment.

Important [illegible]
treatment program.

Treatment must be with [illegible]
[illegible]
[illegible]
[illegible]
of daily handling.

Close [illegible]
select [illegible] thickness [illegible]
factors contributing to [illegible]

GENETIC SELECTION AND BREEDING PLANS

Considering the economic importance of a high reproductive level in beef cattle, there has not been adequate research on the problem of improving reproductive efficiency by selection. The reason, undoubtedly, is due to the acceptance of the relatively low heritability of fertility with the consequent expectation of little progress.

Genetic Selection

While most estimates of the heritability of fertility traits are quite low, Deese and Koger (1967) reporting on fertility of Brahman and Brahman cross cattle in Florida, give heritability estimates of 0.39 for both herds based on paternal half-sib correlations.

Brown, et.al. (1954) of New Mexico reported the heritability and repeatability of calving interval to be essentially zero. Lindley, et.al. (1958) of Oklahoma also reported the heritability of reproductive performance including number of services per conception, gestation length, calving interval, interval calving to first breeding, interval breeding to conception and interval calving to conception, to be close to zero.

The heritability of seminal traits in beef bulls was much higher for crossline bulls than linebred bulls (Adabia, et.al., 1976). Heritabilities for crossline and inbred bulls are listed:

Trait	Crossline	Inbred
Concentration	.28	.17
Motility	.23	-.16
Live cells	.17	.16
Primary abnormals	.30	.09
Secondary abnormals	-.05	-.12
Normal sperm	.24	.04

In a Livestock and Range Research Station (LARRS) study, level of inbreeding reduced birth rate to a marked degree (Rice, et.al., 1961).

Presented by Ray R. Woodward, Location Leader, Livestock & Range Research Station, USDA-SEA-Federal Research/Western Region, Miles City, MT, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

Inbreeding %	Cows Calving	Calving %
0	3852	83.7
0- 4.9	564	82.6
5- 9.9	328	84.8
10-14.9	364	78.8
15-19.9	258	77.7
Over 20	36	70.6

In this same study, cows suckling male calves had a 1.3 percent lower pregnancy percentage than cows suckling female calves. This difference was not significant. Under the range conditions in which the data were collected, virgin heifers and cows raising calves averaged approximately 4 percent higher in conception levels than did dry cows--indicating an additional reason for culling non-pregnant cows the first year they are dry and, despite the low heritability for birth rate, culling dry cows is recommended.

Crossbreeding

As genetic selection does not provide a rapid method of improving reproductive levels, more attention has focused on crossbreeding to achieve the economic benefits of increased calf crop and calf survival. The benefits of heterosis in improving reproductive and survival levels are well known.

Heterosis increase specifically for birth rate was 6.8 percent in comparing straightbred and crossbred dam performance when bred to different breeds of sire (Cundiff, 1970).

Increased productivity in the F_1 generation results primarily from a higher survival level of calves (Cundiff and Gregory, 1977). They report approximately 4 percent more crossbred calves than straightbred calves surviving through 2 weeks after birth. However, greater increases in reproductive efficiency are realized when crossbred dams are bred in a three-breed rotation. The same authors, using a theoretical expectation of heterosis, project 15.5 percent heterosis in a two-breed rotation and 20 percent heterosis in a three-breed rotation based on pounds of calf produced per cow exposed, most of which is realized in improved reproductive efficiency although some results from the increase in weaning weight, per se.

Most reports from crossbreeding research involving Brahman cattle indicate a higher level of heterosis for reproductive traits which may be due to a lower parental level of reproductive performance.

Correlated Responses

There is need for a better understanding of correlated responses affecting fertility as a result of selection for other traits. This is the primary objective of a study recently initiated at LARRS. In this project, an unselected, replicated population is being used to determine the interrelationships among a comprehensive list of factors measuring reproductive, growth, and carcass traits.

Some interesting recent work (Brinks et.al., 1978) indicates that progress can be made in improving reproductive efficiency by considering and using traits relating to reproduction in our selection processes and by further emphasizing research which increases the effect on reproduction of current selection process. Genetic correlations between male and female traits as reported by Brinks, et.al., follow:

	Bulls				
Heifers	Scrotal circum.	Normal Sperm	Prim. abn.	Sec. abn.	Motility
Age at puberty	-.71	-.37	.36	.09	.33

National Sire Summaries

The increase in breeds publishing National Sire Summaries raises the question as to whether these data may be of value in selecting for increased reproductive performance. Unfortunately, most of these summaries are not sufficiently comprehensive to be useful for this purpose. It is believed that in order to be of value it would be necessary that annual cow production be recorded. The amount of data presently required as a pre-requisite for registration appears to be all the system will handle, both from the standpoint of breeders resistance and costs.

This situation poses some interesting probabilities. Will the necessity for improving reproductive efficiency in beef cattle force the present industry structure to improve their records of performance? Or will the industry change with larger, more sophisticated breeding establishments evolving? Present records going into National Sire Summaries are useful only to the degree that calving ease scores and birth weights can improve the calving loss picture.

Summary

Genetic selection for optimizing reproductive efficiency should be given a high priority despite the problem of low heritability of reproductive traits. Selection probably will be more effective in Brahman and Brahman cross herds than in crosses of British breeds.

Crossbreeding, especially with crossbred dams bred to other breeds, is the most effective method for improving reproduction. This fact has been well known for a number of years, but unfortunately, the industry has not adopted systematic crossing programs, probably for the reason that management considerations outweigh crossbreeding advantages. Another alternative to the standard three-breed rotational program might include the use of many breeds with the entire herd being bred to bulls from a single herd unrelated to any of the original crosses. The ability to accomplish such a program is becoming more practical with the increase in continental breeds and combinations thereof with domestic breeds.

Another approach to optimizing reproductive performance is closer scrutiny of various traits related to reproduction and their correlated responses. The positive relationship between testicular circumference and age at puberty is a good example.

Some doubt must be expressed that National Sire Summaries add a great deal to improved beef cattle reproductive levels although the use of sires with low birth weights and calving difficulty scores certainly can increase survival.

ooOoo

Abadia, D., J.S. Brinks, and E.J. Carroll. 1976. Genetics of seminal traits in beef bulls. Proc. West. Sec. ASAS, Vol. 27, p. 30-33.

Bellows, R.A., R.E. Short, D.C. Anderson, B.W. Knapp, and O.F. Pahnish. 1971. Cause and effect relationships associated with calving difficulty and calf birth weight. J. Anim. Sci. 33:407.

Brinks, J.S., M. J. McInerney, and P.J. Chenoweth. 1978. Relationships of age at puberty to reproductive traits in young bulls. Proc. West. Sec. ASAS, Vol. 29, p. 28-30.

Cundiff, L.V. 1970. Experimental results on crossbreeding cattle for beef production. J. Anim. Sci. 30:694.

Cundiff, L.V. and Keith E. Gregory. 1977. Beef cattle breeding. Agr. Inf. Bull. 86, USDA.

Deese, R.E. and M. Koger. 1967. Heritability of fertility in Brahman and crossbred cattle. J. Anim. Sci. 26:984.

Lindley, C.E., G.T. Easley, J.A. Whatley, and Doyle Chambers. 1964. A study of reproductive performance of a purebred Hereford herd. J. Anim. Sci. 17:336.

Rice, F.J., R.R. Woodward, J.R. Quesenberry, and F.S. Willson. 1961. Fertility of beef cattle raised under range conditions. Montana Agr. Expt. Sta. Bull. 461.

WHERE ARE WE WITH ESTRUS SYNCHRONIZATION?

The use of an estrus synchronization technique to bring a group of cows or heifers into standing heat within a one- or two-day period would substantially reduce and concentrate labor for more efficient beef and milk production when employing artificial insemination.

Presently, there are two types of systems being investigated to synchronize estrus in cattle. One system involves the use of a progestogen and an estrogen, and the other system involves the use of prostaglandins.

"Syncro-Mate-B" (SMB) is being tested by G.D. Searle and Co. This system requires an injection of a combination of 3 mg Norgestomet and 5 mg estradiol valerate at the same time a cow is implanted with 6 mg Norgestomet in the ear.

There are two types of prostaglandins being tested with promise. "Lutalyse" comes from the Upjohn Company. It is the prostaglandin F2α (PGF2α) and is effective with injections of 25 mg.

"Estrumate," produced by Imperial Chemical Industries, Ltd., often goes by the name cloprostenol ICI 80,996. This is a PGF2α analogue and has a very similar structure to Lutalyse though different enough to keep the patent lawyers off their back. The difference, however, is enough that only a 0.5 mg injection is enough to make it effective. (You can bet there isn't going to be that much difference in price.)

CURRENT ESTRUS SYNCHRONIZATION TECHNIQUES

Prostaglandins	--	"Lutalyse"
		"Estrumate"
Progestogen	--	"Syncro-Mate-B"

Presented by Clif Marshall, Reproductive Specialist, Select Sires, Inc., Plain City, OH, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

TRADE NAME	SUPPLIER	TECHNICAL NAME	DOSAGE
Syncro-Mate-B	G. D. Searle	Norgestomet Estradiol Valerate	6mg Progestogen implant plus injection of 3mg Progestogen and 5mg E.V.
Lutalyse	Upjohn	PGF2α	25mg Im or SC
Estrumate	ICI	Cloprosterol (ICI 80,996)	.5mg Im or SC

Reproduction Physiology Review

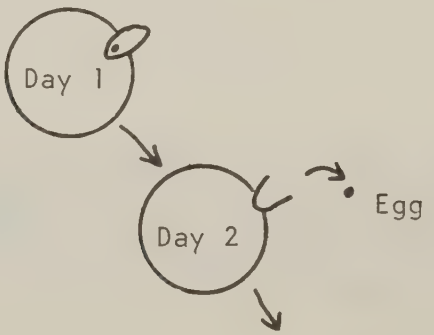
To understand how either of the estrus synchronization systems work and what the limitations are, we must understand how the estrus cycle works. Let's make a quick review.

Let's say that on Day 1, the cow is in heat. Having a follicle on one ovary with a mature ovum down inside, she is said to be in the follicular phase of her cycle. The follicle is producing high levels of estrogen which cause her to display the many characteristic signs of estrus.

ESTRUS CYCLE DAY 1:

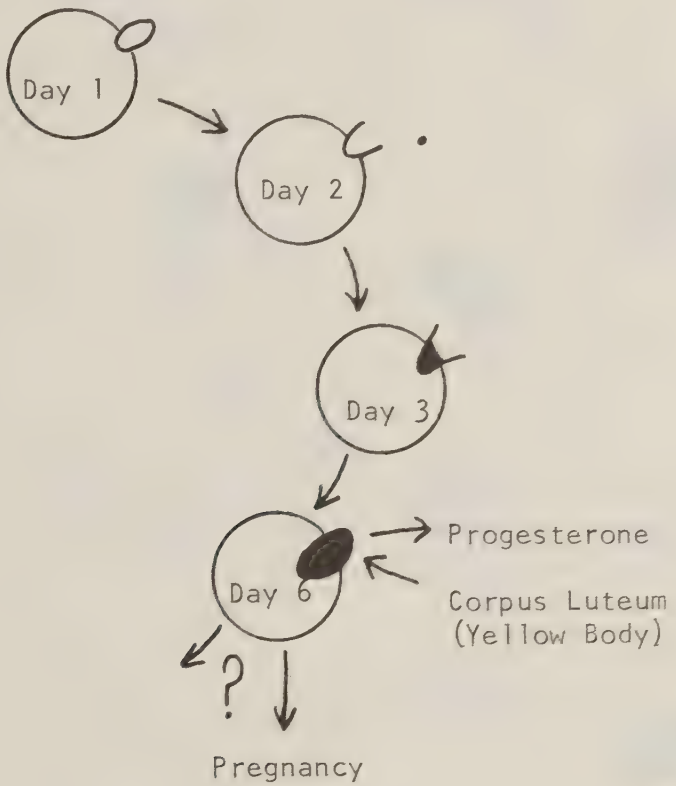
By Day 2, the follicle will have ruptured, the egg released, and estrogen production ceased.

ESTRUS CYCLE DAY 2:



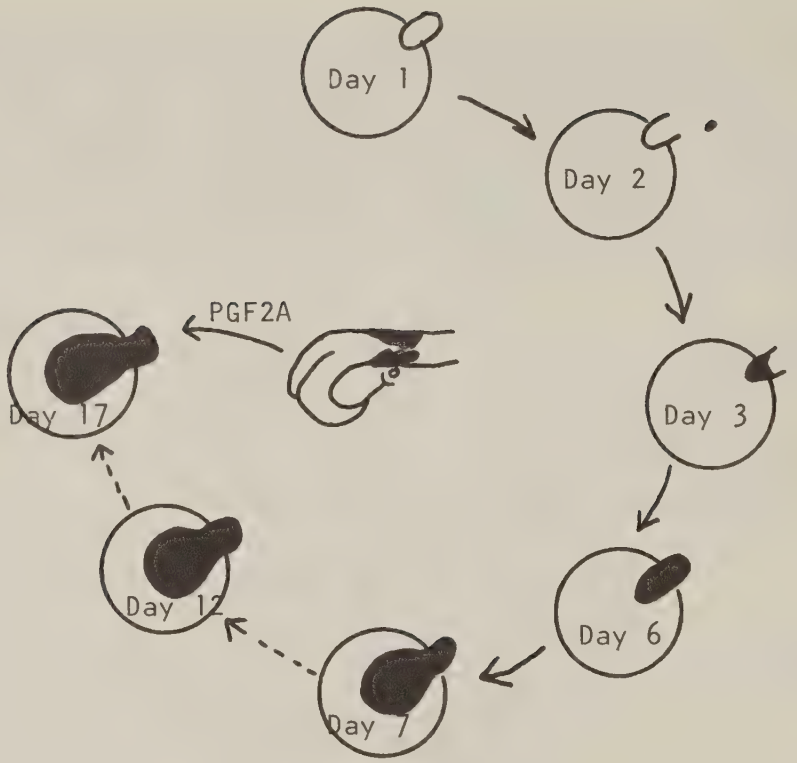
In this depression where the follicle was, luteal cells begin to grow, filling the void and building a structure protruding above the ovarian curvature. This structure, the corpus luteum (CL) continues growing and at maximal size accounts for 60-70 percent of the ovarian weight. The CL produces progesterone which has many functions. One is to prepare the uterus for embryo implantation and another is to block production of Follicle Stimulating Hormone (FSH).

ESTRUS CYCLE DAY 6:

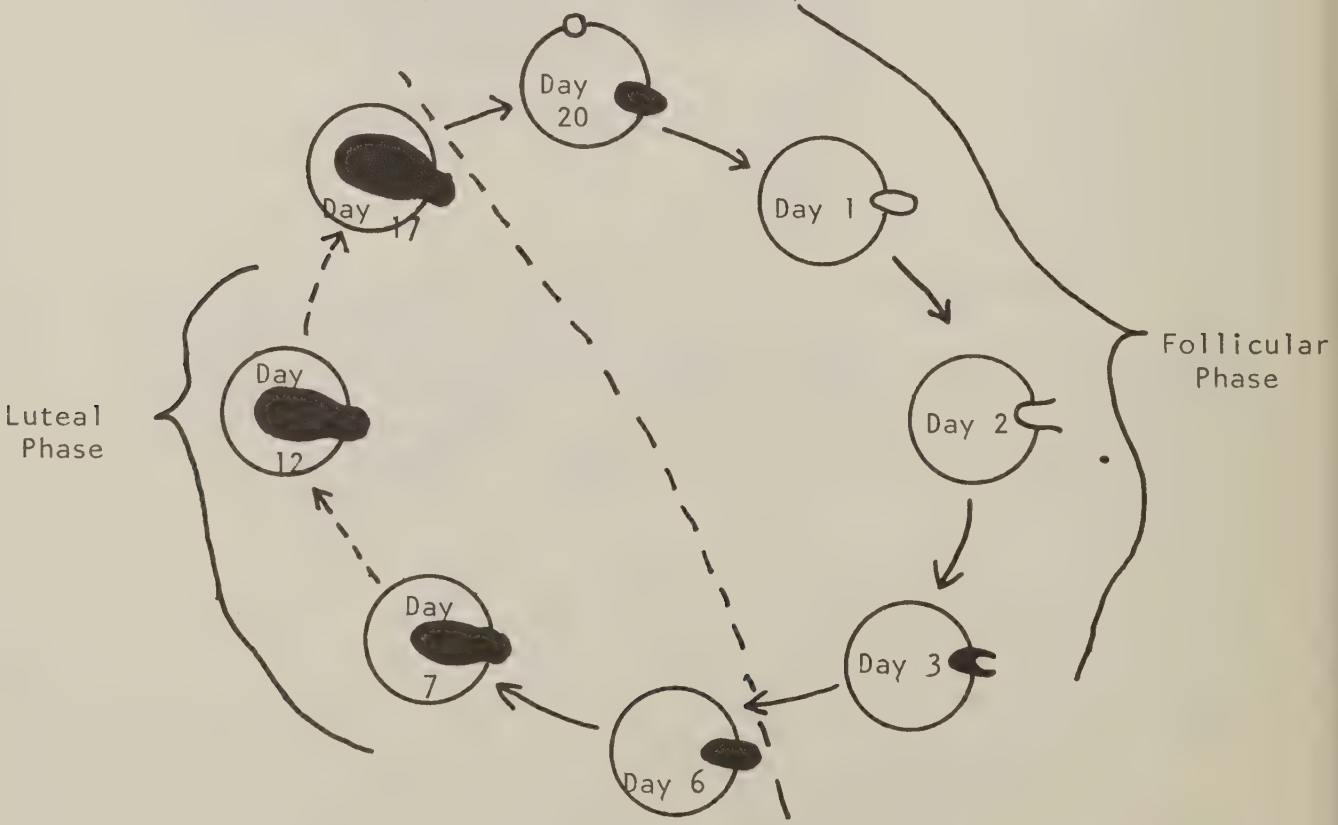


The cow is now in luteal phase of the cycle.

This is all fine and dandy for the pregnant cow which we wouldn't want coming back into heat for awhile, but what about the cow who didn't get bred? About 16 or 17 days after the cow was in heat, the uterus, sensing that it is not pregnant, begins to produce a prostaglandin.



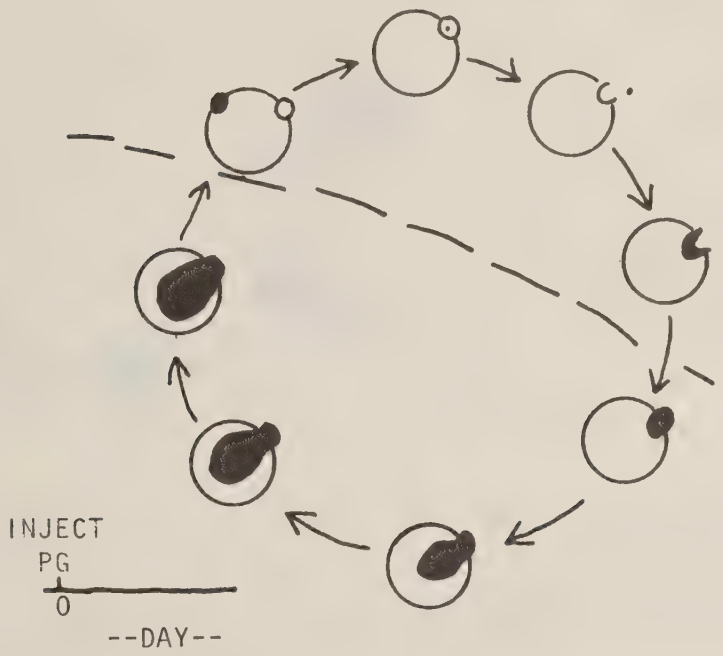
Prostaglandin F2α is a luteolysin. This means that will "dissolve" luteal tissue. With the CL gone, the FSH block is removed and a new follicle will begin to develop on one or the other ovary. Thus, in a normal 21-day period, a cycle is completed.



How Does the Prostaglandin System Work?

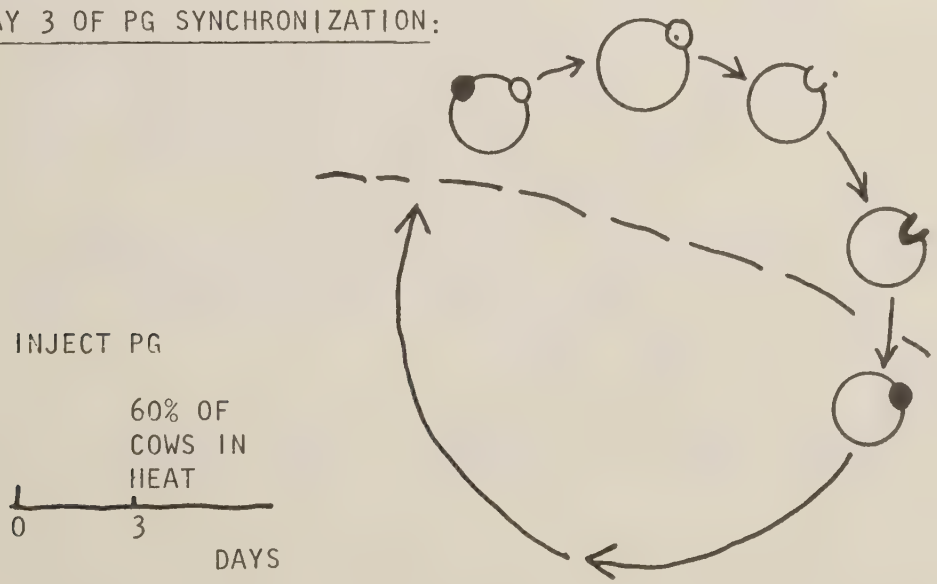
Let's give a randomly scattered herd of 100 cows an injection of prostaglandin (either Lutalyse or Cloprostenol). The PG would lyse the corpora lutea of all animals which were in the luteal phase.

DAY 0 OF PG SYNCHRONIZATION



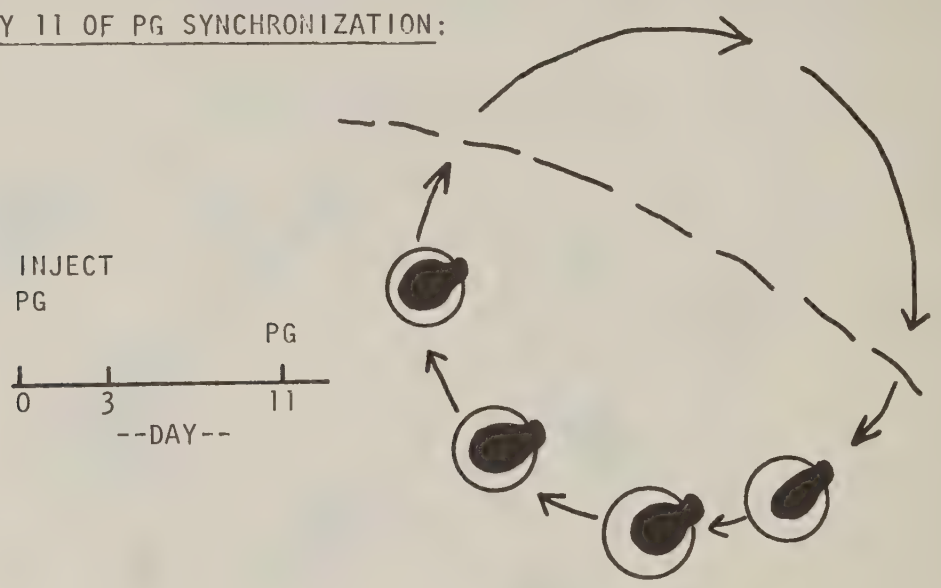
Between 2 and 4 days later, 60-65 percent of the cycling animals would be in heat. Animals not having a functional CL (including those in heat and those ±3 days of heat, on the day of injection, would not be affected.)

DAY 3 OF PG SYNCHRONIZATION:



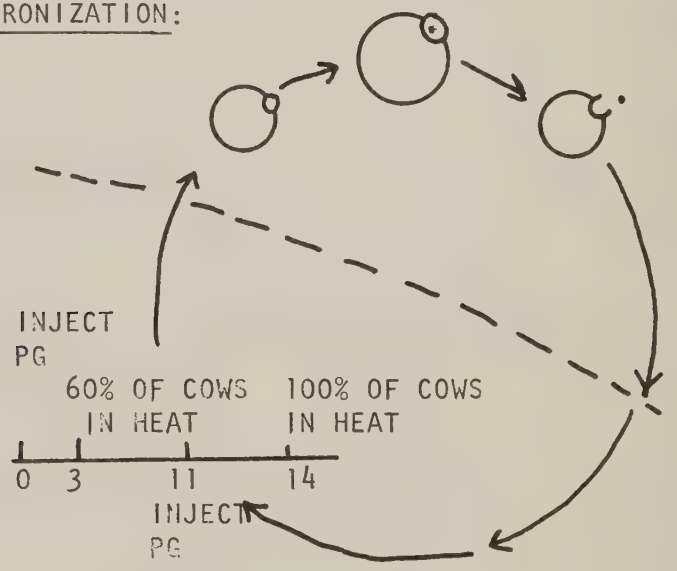
If we ignore the animals at this time and wait until Day 11, 100 percent of the cycling animals would be in the luteal phase; and we would give all animals a second prostaglandin injection.

DAY 11 OF PG SYNCHRONIZATION:



Between 2 and 4 days later, most animals will have been in heat; and the herd is synchronized.

DAY 14 OF PG SYNCHRONIZATION:

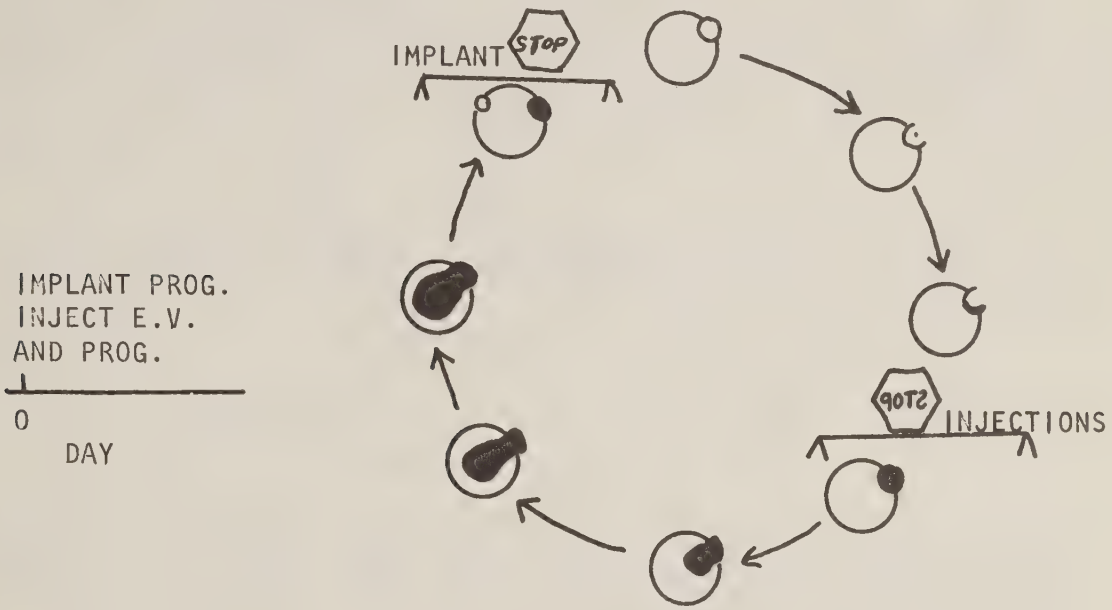


How Does Syncro-Mate-B Work?

This system is an entirely different concept than that involved with the prostaglandins. Again, we have a herd randomly scattered

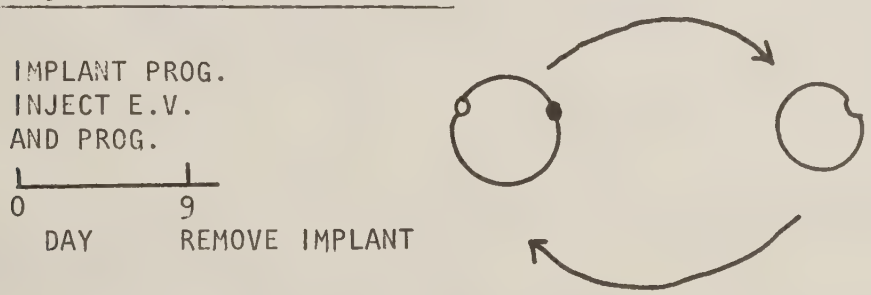
around the cycle. With the injection and implant, we are putting road blocks in the normal cycling process.

DAY 0 OF SMB SYNCHRONIZATION:



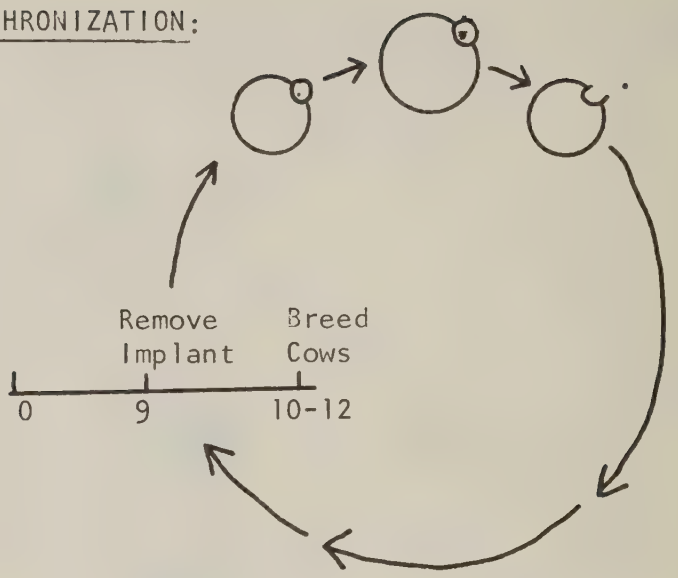
The progestogen and estradiol valerate injection prevent any CL development of cows in the early stages of the cycle (Day 1-9) while the progestogen implant is a block that prevents follicular development of animals, which, over a 9-day period undergo normal CL regression.

DAY 9 OF SMB SYNCHRONIZATION:



After 9 days, the ear implant is removed; and all normal animals develop a follicle and ovulate in 2 or 3 days.

DAYS 10-12 OF SMB SYNCHRONIZATION:



Notice carefully that this mechanism of follicular and CL inhibition operates only in cycling animals. The same treatment often induces a synchronized estrus in non-cycling animals. The amount of induction is related to body condition, nutrition, and post partum interval in cows and by weight in heifers.

Field Trial Results

Most studies of both systems have shown that if animals are cycling, one can expect conception rates of synchronized animals similar to those with animals not synchronized. A recent trial conducted by Upjohn shows that synchronized cows bred 12 hours after being observed in heat had the same conception as the controls. Animals inseminated 80 hours after the second injection, whether they were in heat or not, had a lower conception rate because a high percentage of the animals were not cycling.

PREGNANCY RATES OF CATTLE SYNCHRONIZED WITH LUTALYSE

		Synchronized	
	Control	Bred 12 hours after S.H. after 2nd injection	Bred at 80 hours after 2nd injection
Number	1375	1053	1015
% Pregnant in 24 Days	62%	59%	41%
Units of semen/preg.	1.61	1.69	2.44

In a trial of a little different design, using SMB in herds where less than 50 percent of the animals were cycling, animals synchronized and bred at standing heat (SMB-E) had a conception rate of 32 percent, while control animals were 17 percent. There was no difference in conception rates between the 2 groups when over 50 percent of the cows were cycling. Animals inseminated at a specific time (SMB-T) after implant removed, had calves removed for 48 hours and a direct comparison of the other treatments is impossible.

PREGNANCY RATES AFTER 24 DAYS OF CATTLE SYNCHRONIZED WITH SMB

% of Herd Cycling	Control	SMB-E	SMB-T
50	17	32	41
50	56	59	66

A recent study comparing conception rates of animals synchronized by these two methods with controls yielded the following results:

CONCEPTION RATES OF COWS SYNCHRONIZED WITH SMB OR PGF2α AND INSEMINATED AT FIXED INTERVALS AFTER TREATMENT

	Control	SMB	PGF2α
Number	324	499	504
Insem. after treatment (hrs.)	---	48±2	78±2
Palpated Conception Rate	43%	52%	39%

Management Aids

From previous discussion, the necessity of cycling cattle for successful estrus synchronizing is evident. Dealing with the anestrous animals in herds will be the biggest problem the A.I., the Veterinary, and Ag Extension Industries face if estrus synchronization is to be a long range success. Trying to rush Mother Nature by trying to breed heifers which are too young or not large enough will result in disaster.

INFLUENCE OF AGE ON PERCENTAGE OF SIMMENTAL HEIFERS DETECTED IN HEAT AND INSEMINATED

Age (Mo.)	% in Heat
11	16.7
12	34.4
13	42.9
14+	49.1

Young 2- and 3-year-old cows are particularly susceptible to low nutritional planes since they are suckling calves, trying to grow themselves as well as reproduce.

Evidence shows that cows in poor condition have a lower cycling percentage than those in moderate or fat conditions.

INFLUENCE OF COW CONDITION IN PERCENTAGE DETECTED IN HEAT AND INSEMINATED

Condition		% in Heat
2 3	Poor	30.0
4 5 6	Moderate	44.2
7 8	Fat	40.0

There are 3 good ways of overcoming skinny cows and hopefully get them cycling again.

1. Feed 'em.
2. Feem 'em more.
3. Feed 'em even more yet.

Putting calves on creep feed will reduce the milking stress on the mother and get a few more cycling.

EFFECT OF CREEP FEEDING OF CALVES ON REPRODUCTIVE PERFORMANCE OF MOTHERS

	% in Estrus	% Pregnant
No. Creep Feed	50	25
Creep Feed Provided	74	53

One must realize improved feeding practices must begin several weeks before the breeding season begins rather than 2 or 3 days.

Removing (shanghaiing) calves from their mothers for 48 hours will improve the percentage of cows cycling in a herd during SMB synchronization.

EFFECT OF 48-HOUR CALF REMOVAL ON COWS IN HEAT AND PREGNANCY RATE

	% in Estrus @ 21 Days	% Pregnant
Control	31	17
Shang	62	44
SMB-No Shang	68	40
SMB-Shang	88	58

There is little evidence presently showing whether or not this will help prostaglandin synchronized cattle.

Who Is Cycling?

Knowledge of which animals are and which animals aren't cycling will provide the herd owner with factual information on whether or not to go ahead with the program.

Ovarian palpation by a good veterinarian or other experienced individual will detect anestrous animals. Removing them from the cycling animals and giving them a little more feed will be of benefit.

The application of some sort of heat detector aid such as Ka MaR back patches or marker crayon on the tailhead and observation for a 10-12 day period will give the owner some idea as to what percent

of the animals are cycling. If the percentage is low, he can make a decision on whether to press ahead with the animals available or to drop back and punt.

Application of the aids at the time of the last prostaglandin injection or at SMP implant removal and then only breeding animals with activated tags will save on semen costs but not on drugs.

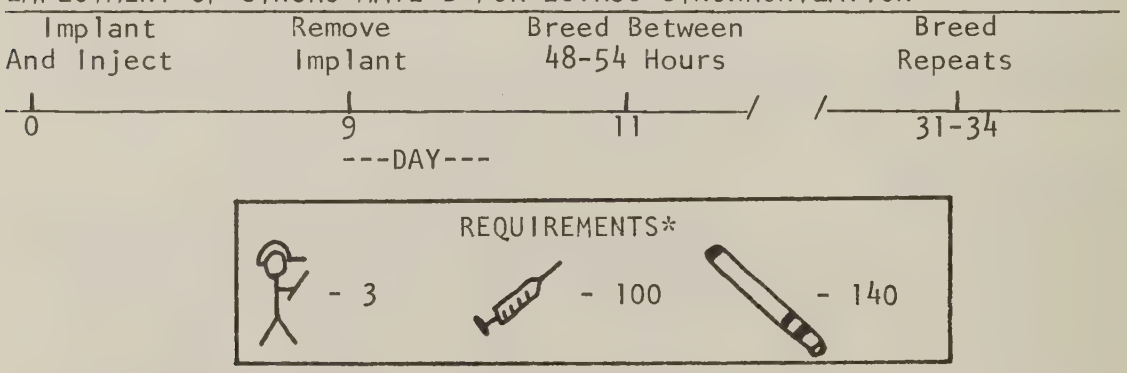
PREGNANCY RATES OF SYNCHRONIZED CATTLE WITH KAMAR HEAT DETECTORS IN VARIOUS STAGES OF ACTIVATION AND INSEMINATED ABOUT 80 HOURS AFTER SECOND P.G. INJECTION

Degree of Activation	% Pregnant
Full	67%
Partial	23%
None	13%
Tags Off	51%

Management Regimes

The SMB system is quite rigid in how it is to be used. Implant and injection are followed 7-12 days later by implant removal and the cows being inseminated 2-3 days later.

EMPLOYMENT OF SYNCRO-MATE-B FOR ESTRUS-SYNCHRONIZATION



*Requirements:

-- Number of Working Days.

-- Units of drug per 100 animals.

-- Units of semen per 100 animals (Assuming a 60% First Service conception rate).

The only variation in procedures is the owner deciding whether or not he wants to shanghai the calves.

EMPLOYMENT OF SYNCRO-MATE-B FOR ESTRUS SYNCHRONIZATION (WITH EXTRAS)

Implant And Inject	Remove Implant Pull Calves	Breed at Standing Heat Return Calves	Breed Repeats
0	9	10-12	31-34

---DAY---

H.D.A. -- Heat Detector Aids (KAMAR, Crayon, etc.)

The prostaglandin system is flexible and--depending on labor, capital, and herd size--one can split the breeding and calving period--only synchronize half the eligible cows or inseminate all animals at one time.

PRACTICAL METHODS FOR USE OF PROSTAGLANDINS (POOR VISIBILITY)

Inject PG	Inject PG	Breed @ 75-80 Hours
0	11	14

---DAY---

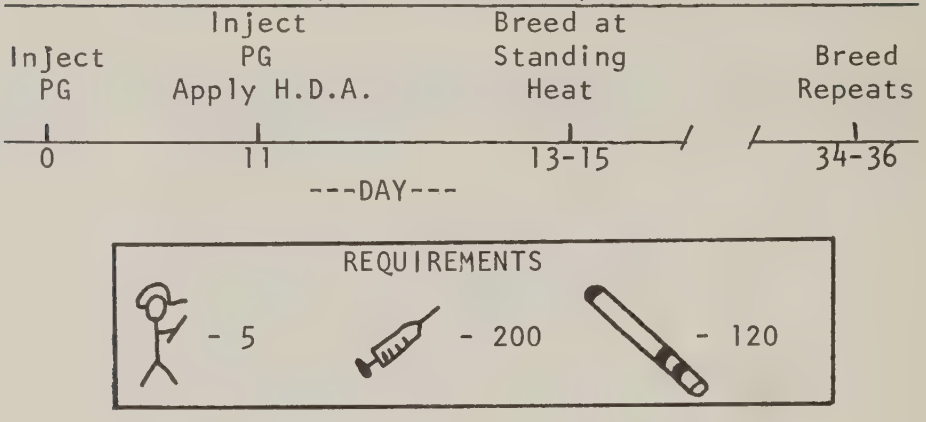
REQUIREMENTS

 - 3

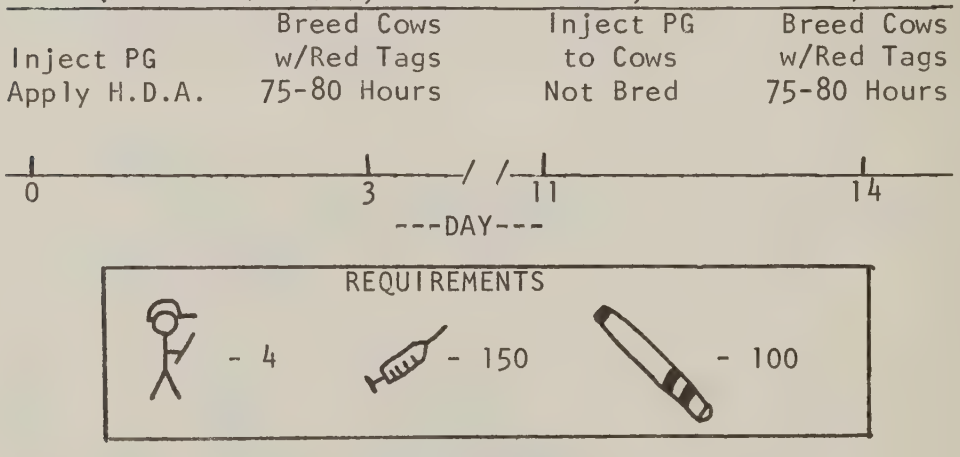
 - 200

 - 100

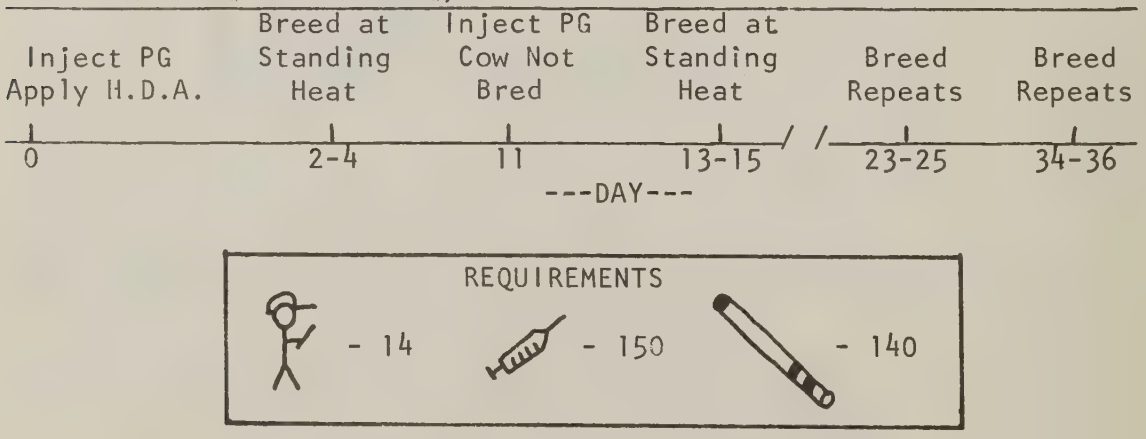
PRACTICAL METHODS FOR USE OF PROSTAGLANDINS
(GOOD VISIBILITY)



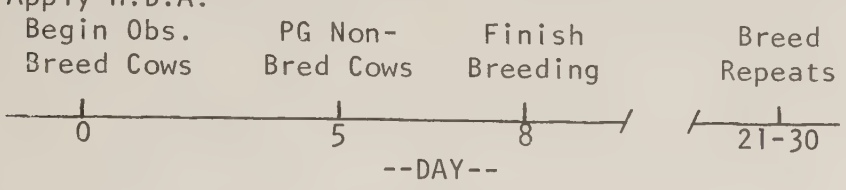
PRACTICAL METHODS FOR USE OF PROSTAGLANDINS
(POOR VISIBILITY, SPLIT BREEDING, AND CALVING)

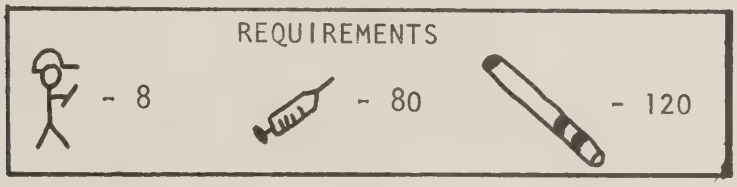


PRACTICAL METHODS FOR USE OF PROSTAGLANDINS (GOOD VISIBILITY, SPLIT BREEDING AND CALVING)

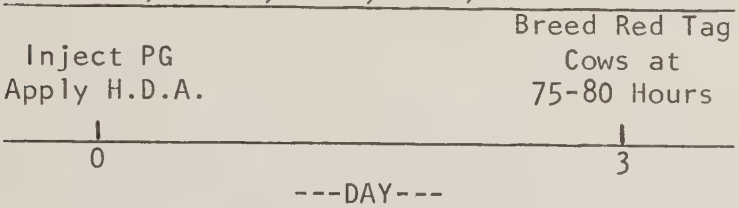


PRACTICAL METHODS FOR USE OF PROSTAGLANDINS (GOOD VISIBILITY-SHORT AI SEASON)





PRACTICAL METHODS FOR USE OF PROSTAGLANDINS (LIMITED, LABOR, CASH, TIME)



Other Considerations

Careful preparation and detailed logistical planning are necessary. Facilities, equipment, and people are the main items to consider. Inseminating 100 cows in one afternoon is no picnic even under the best of conditions. A workable squeeze chute with room for the inseminator to slip through a gate and do his job without fear of being mounted by an anxious individual is a must!

Having facilities so animals can be worked out of the hot sun or cold snow will reduce the stress on man as well as beast.

Providing protection against dust and the elements for the people handling semen will give the owner a better chance of success.

Although we all think we can do more than we actually are capable, inseminating cows is one area we can set aside our chauvinistic pride. One experienced inseminator for every 20 to 30 animals per day is a good rule of thumb.

Other Considerations in Estrus Synchronization Program

1. Technician Supply.

2. Facilities

    a. Clean and Warm During Injecting and Breeding.

    b. Heat Detection.

3. Time Available.

4. Plan Logistics.

Summary

The success of any estrus synchronization program whether it be with progestogen or prostaglandins will be dependent on the percent of the animals cycling, the quality of semen used, and the ability to handle the semen properly and put it where it belongs.

Careful consideration, cooperation, and planning by the herd owner, his veterinarian, and A.I. personnel will enable all involved to do their best and achieve the results desired.

ooOoo

THE UPJOHN APPROACH TO THE MARKETING OF LUTALYSE

Lutalyse®, the generic name of which is dinoprost tromethamine, is a salt of the naturally occurring prostaglandin--F2 alpha. When approved by the Food and Drug Administration, it will be indicated for its luteolytic activity in beef cows and heifers and dairy heifers. It will be used to control the timing of estrus and ovulation in estrus cycling cattle that have a corpus luteum. Two 25 mg doses of Lutalyse at 11-day intervals will result in a high proportion of cattle expressing estrus in a period of 2 to 5 days after the second injection. Cattle may be bred by artificial insemination during the pre-defined 2- to 5-day period or artificially inseminated 80 hours after the second injection without regard for estrus expression.

Lutalyse will be approved by the FDA as a prescription product. It will, therefore, be sold only through licensed veterinarians.

There are, of course, many factors to be considered in making an artificial insemination/Lutalyse program a success. Among these factors are a quality A.I. program, a herd in top health, a herd on a good nutritional program, and adequate cattle handling facilities. In other words, good management is an important factor. To achieve successful artificial insemination, you need high quality semen that is properly stored, correctly handled, and administered by a capable inseminator.

But, even with these quality A.I. elements, there have been stumbling blocks to the successful incorporation of A.I. into a breeding program. Probably, one of the most serious blocks involves the observation for heat. Many beef producers, for example, have found that the time, labor, and pasture requirements involved in observing for heat in a large number of cattle make A.I. seem impractical. With the Lutalyse program, groups of cattle can be brought into the smaller fields, injected, and bred in a limited time span.

Other stumbling blocks include cows that are in silent heat or at least are not observed to be estrus cycling. These cattle can be inseminated on a timed A.I. program with the schedule of the rest of the herd.

Presented by James H. Sokolowski, D.V.M., Product Manager-Agricultural Marketing, The Upjohn Company, Kalamazoo, MI, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

Health and nutritional status of cows involved in an A.I. program are also important factors to a successful breeding program. A recent experiment station study showed that cows fed to gain before and after calving have the maximum opportunity to become pregnant.

There are certain physical facilities necessary for an A.I. estrus control program. Among these facilities are holding pens, corrals, and breeding chutes. Since most dairymen already use A.I., they should experience little change in the necessary equipment associated with this type of program. During the field testing of Lutalyse, we have found that most successful cooperators had most, if not all, these elements.

What kind of results have we obtained with a Lutalyse program? First of all, Lutalyse is not a cure-all. The cattleman can expect pregnancy rates similar to what he has previously observed. The benefit comes from fewer days of A.I. to reach those pregnancy rates, reduced labor to observe for heat, and more efficient use of A.I.

As indicated, successful use of Lutalyse and A.I. was predicated on sound management, usable facilities, and quality semen and insemination.

Understanding of Lutalyse use and misuse, success and failure, will require an extensive educational program at all levels. Upjohn has already started this educational program through technical presentations, discussions with leaders in several areas of the beef and dairy industries, and by publication--technical and others. We are preparing technical literature, question and answer brochures, and slide series to assist the veterinarian, the cattle owner, and the A.I. industry.

Veterinary education programs will be provided at the regional, State, and local level by Upjohn Technical Service veterinarians. Veterinarians will also receive detailed information through Upjohn's direct sales force.

Part of Upjohn's marketing approach will, therefore, be to have extensive educational programs aimed at the producer, the inseminator, and the veterinarian in each of the segments of the industry in which Lutalyse will become an important factor.

When will Lutalyse be available? We are expecting a 1979 approval from FDA for marketing of Lutalyse.

What will it cost? Lutalyse will cost $6 to $10 for the 2 injections--cost from the veterinarian.

- Lutalyse -- the natural prostaglandin.

- Available from veterinarians in 1979.

- Double injection -- breed-A.I. at day 2 to 5 or at 80 hours.

- Results -- similar pregnancy rate to controls--benefit in less labor and, therefore, less dollars.

ooOoo

CURTISS' APPROACH TO MARKET SYNCRO-MATE-B®

Curtiss has taken the approach that there will someday be one or more estrous synchronizers available for use in the cattle breeding industry. It is our hope that Syncro-Mate-B® will be one of these. Curtiss' efforts to market Syncro-Mate-B® will be directed toward the producer and product knowledge with its relation to herd management taking top priority.

The concept of synchronization in cattle, thereby controlling ovulation, is not new and has been undertaken with limited success in the past. Because of the lack of total success with synchronization in the past, caution and careful planning introduction steps leading to implementation at the producer level must be presented and developed thoroughly. In short, we must maximize successes and minimize failures. To do this, eligible females must be created.

There are many documented cases of successful synchronization in beef cows, beef heifers, and dairy heifers throughout North America. Unfortunately, there is also evidence of failures.

Four years ago, Curtiss initiated market research studies to apprise ourselves and our company of the potential uses of synchronization and ovulation control. After many contacts with industry leaders, market research studies with producers, and complex modeling with computer systems, we reached the conclusion that estrous synchronization, to be successful long term, must be accomplished on a timed insemination basis. Our efforts are directed toward the management requirements of controlled ovulation with timed insemination.

There are many reasons why cows and heifers fail to synchronize or fail to conceive or a combination of these two. The primary reason correlates to the nutritional status of each individual in the herd. Those animals that have received adequate nutrition with balanced rations are eligible and give positive response to synchronization and to high conception rates.

The timing of this nutrition is extremely important and must be looked upon as one of the critical areas in maximizing good results with estrous synchronizers. This timing factor is that the cow or heifer must receive adequate levels of nutrition including protein,

---

Presented by Ronald D. Long, Vice President-Marketing, Curtiss Breeding Service, Cary, IL, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

energy, and minerals 365 days of the year. Any attempts to short-cut the cow or heifer at any time during the calendar year can produce negative results with estrous synchronization and contribute to poor conception rates.

Identifying eligible heifers is dependent on their age and weight. There are differences in our trial results between representatives of the British breeds and representatives of the Exotic breeds. Angus and Hereford, or combinations of these two breeds, reach sexual maturity earlier in life and will conceive more quickly than animals of the Charolais, Simmental, Maine-Anjou, Limousin, and other Exotic breeds. Cattle producers who intend to use estrous synchronization in the future must realize that the breed of animal they're working with is extremely important with regard to age of puberty. This factor cannot be completely controlled by nutrition.

The second portion of heifer eligibility is nutrition. The bigger breeds, such as the Exotics and extremely large representatives of the Angus and Hereford breeds, must have at least 150 lbs. more weight to go along with their structural frame size than the average Angus and Hereford.

Post-partum intervals in cows must be considered. Many producers work under the philosophy, and certainly sincere belief, that they have been successful in bunching their cows into a 60- to 70-day calving season. In reality, most herds have calving intervals spread over at least 120 days. Good management practices lead to efforts to group the calving interval closer. It is our sincere fear that this will lead to disaster if producers look upon estrous synchronizers as a means to shorten post-partum intervals. The uterus must be allowed sufficient time following calving so normal reproductive functions may resume. All cows which are treated with an estrous synchronizer should be at least 60 days post-partum to be eligible for a synchronizer to have fair opportunity to successfully synchronize the cow.

The above management considerations are key issues in identifying eligible females. We have reached the time in synchronization development when our attention must be turned to explaining the entire process to producers.

This task will become large in effort and patience. It will require the cooperation of Extension and industry personnel. The success or failure of estrous synchronization will depend on this cooperation. Together we must have a keen understanding of product knowledge, and we must explain the concept of eligible females to producers continuously.

Estrous synchronization is very important to artificial insemination in the future. The individual involved with artificial insemination is the last person to have contact with the bovine animal before conception. A great deal of responsibility lies on this individual's shoulders. His ability, credibility, and the confidence he instills in his customer, or in his total breeding operation, will be measured by the success of the synchronizers to control the ovulation of the cow. His ability to deposit semen at the proper place, the proper time, and with the proper methods in order to insure maximum conception become critical. His ability will result in success or failure of synchronization products. Artificial insemination companies must play a strong role in technician training, short courses in physiology of reproduction, nutrition, and education on synchronizer products.

If there is truly a desire on the part of producers to use estrous synchronization, agricultural Extension specialists to assist cattle producers with estrous synchronization products as management tools, and artificial insemination companies to maximize conception with estrous synchronization rather than simply sell added quantities of semen, then these combined desires must be meshed together. Combined efforts through strategy sessions, establishing proper management guidelines, and the willingness to go slow will lead to the successful introduction of estrous synchronization.

There must be a starting point; and, quite frankly, that starting point becomes people. It is the people who are here today, attending this conference, who will make estrous synchronization a success or a failure. The time to start is prior to approval and marketing of a synchronizer product. The starting media is university personnel, Extension staffs, artificial insemination companies, and livestock producer groups. With the proper product knowledge, the appropriate nutrition and health education programs, and a tremendous amount of work and effort, estrous synchronization will become successful as a genetic and economic breakthrough for beef cattle producers and dairy farmers.

ooOoo

THE ROLE OF PROSTAGLANDINS IN THE BEEF HERD

Introduction

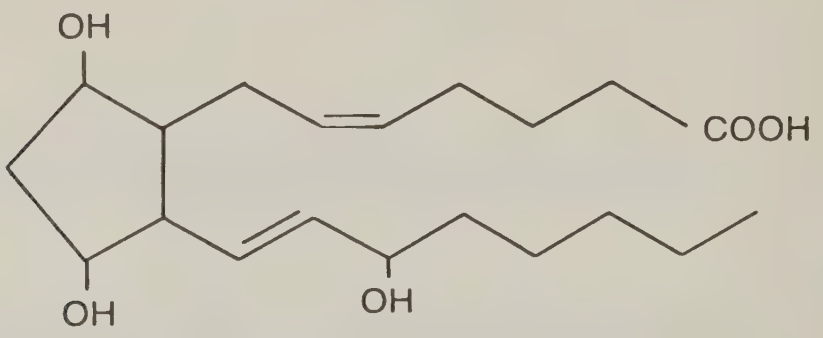
The discovery of the beneficial role of prostaglandins in bovine reproduction has led to new concepts in controlling the breeding of cattle.

$PGF_{2\alpha}$ and its analogues (Table 1) are effective in the control of breeding times because they shorten the life span of the corpus luteum or "C.L.," the temporary endocrine gland that produces progesterone which in turn prevents estrus and ovulation.

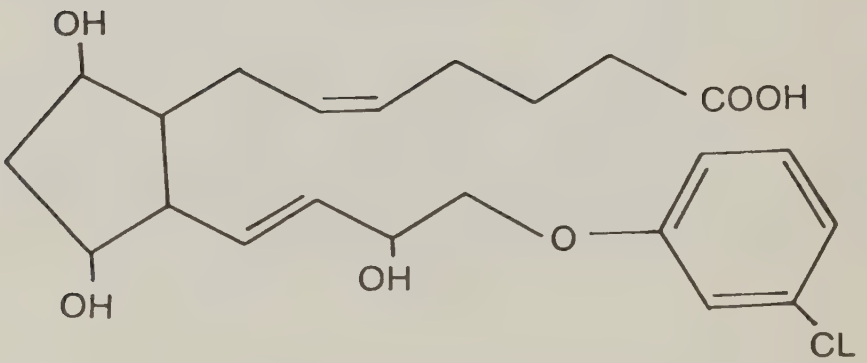
Prostaglandins have the potential of being used as a tool for the veterinarian and rancher to replace the estrus cycle of the cow under their control rather than leaving the estrus cycle to the discretion of the cow. Obviously, this opens new opportunities for artificial insemination in the beef herd, especially where the major objection to AI has been heat detection.

Presented by J.D. Canady and D.D. Copeland, Animal Health Dept, ICI Americas, Inc., Wilmington, DE, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

TABLE 1. CHARACTERISTICS OF CLOPROSTENOL



$PGF_{2\alpha}$



Cloprostenol (ICI 80,996)

- An Analogue of Prostaglandin $F_{2\alpha}$
- Potent Luteolytic Agent
- High Safety for Treated Animal
- Standard Dose 500 mcg IM
- Acts Only on Mature Corpus Luteum
  Cattle Must Be Cycling
- Aborts Pregnant Animals

Possible Controlled Breeding Program Objectives

Estrus control products allow the beef herd manager the opportunity to more efficiently meet some of the breeding program objectives that may have been difficult if not impossible to achieve without these products. Some of the possible breeding program objectives that estrus control products may assist a herd manager to attain are noted in Table 2. To fully achieve some of these objectives, other management changes may be required in addition to estrus control. For example, a tight calving season may require estrus control in addition to a strict culling program.

TABLE 2. POTENTIAL PROGRAM OBJECTIVES

1. Maximize number of AI calves.
2. Maximize weaning weight.
3. Reduce labor.
4. Reduce or eliminate heat detection.
5. Maximize replacement potential.
6. Tighten breeding season.
7. Tighten calving season.
8. Market calves of more uniform age and size.
9. Maximize use of selected bulls.
10. Better fit other schedules.
11. Use AI more conveniently.

Criteria for a Successful Controlled Breeding Program

Field trial work with cloprostenol as well as experience with cloprostenol in countries, such as Canada where the product is available commercially, have shown there are certain management and animal criteria that must be met in order to successfully implement a controlled breeding program.

Management Requirements

1. Establish Program Objectives. It is extremely important that prior to implementing a controlled breeding program the herd manager establish his program objectives. He must then select a breeding program that will allow him to best achieve those objectives. Experience has shown that even in a controlled breeding program where fertility results have been good, the program selected may not assist in achieving the program objectives; therefore, the entire breeding program was then considered a failure by the herd manager.

2. Good Records. A complete set of accurate herd records is essential. Records are very important in selecting animals to enter in the controlled breeding program; i.e., proper post-partum interval. Records are also important for the purpose of establishing and evaluating breeding program objectives.

3. Proper Timing of Injections and Breeding. Experience has also shown that the person in charge must have the program well organized. Attention must be paid to insure proper timing of injections and breeding in order to obtain optimum results. Forward planning is required to make sure all injection and breeding dates are free of conflicts in scheduling of other activities. Also, once a program is initiated, it must be carried through to its completion.

4. Good Semen Quality. For best conception rates, semen must be top quality with semen storage and handling techniques of the highest caliber.

5. Good Breeding Techniques. An experienced, well-trained technician may be even more important in a scheduled breeding program than in a conventional AI program. The technician may be required to breed a large number of animals in a relatively short period of time. He should honestly appraise the number of animals he can breed before fatigue begins diminishing his ability. In many cases, a second or even third technician should be called in on heavy breeding days so technicians can trade off. In addition, the technician must be certain that semen thawing and handling techniques are well planned and organized in advance.

6. Coordination of All People Involved. The individual coordinating the controlled breeding program must make sure all people involved in the program are available and committed to program event days.

7. Good Working Facilities. Facilities must be critically evaluated prior to the initiation of a breeding program. Alterations, modifications, and repairs to facilities must be made prior to initiation of the program. This requirement is frequently overlooked with disastrous results.

8. Attention to Details. The individual coordinating the program should develop a checklist of all events and their timing, people needed, and facilities and equipment required so nothing is overlooked.

Animal Requirements

1. Disease Free. Animals entering a controlled breeding program should be free of diseases, particularly diseases that could adversely affect breeding results. The herd should be on a preventative herd health program.

2. Heifer Maturity. Heifers that are considered potential candidates for a controlled breeding program must be through puberty and sufficiently mature for normal fertility.

3. Adequate Post-Partum Interval. Cows should have adequate rest after calving to insure that the reproductive tract has returned to normal, and the animals have a high probability of cyclic activity.

4. Adequate Plane of Nutrition. Heifers should be receiving adequate energy to reach puberty as early as possible. Heifers and cows should be on an inclining plane of nutrition (gaining weight) prior to the breeding season to insure maximum cyclicity of the herd. Also, adequate energy throughout the breeding period is necessary for optimum conception rates.

5. Animals Must Be Cycling. Cloprostenol trials have demonstrated that the anestrous problem exists as a significant factor in beef herds in the U.S. and Canada. Even in herds where management and nutrition are well above average, the percent of animals over 50 days post-partum and still not cycling is surprisingly high. Table 3 shows various beef herds and the number of animals over 50 days post-partum that were cycling at the time a planned breeding program was initiated.

   In order to keep controlled breeding programs as economical as possible, it is necessary to segregate cycling from non-cycling animals. This is demonstrated by the figures presented in Table 4. Data in this table is from a typical beef herd where animals over 50 days post-partum were considered as potential controlled breeding program candidates. It was determined that 142 of the 243 animals in the herd were cycling. In this herd, cycling animals were segregated from non-cycling animals by rectal palpation of the reproductive tract. These data show the expense that would have been incurred had cycling and non-cycling animals not been segregated. This is compared to the expense incurred using palpation to include only cycling

animals. On an economic basis, it can readily be seen that it is absolutely necessary to include only cycling animals in a controlled breeding program.

6. Non-Pregnant. Animals should be examined to insure they are not pregnant. Prostaglandin should not be given to a pregnant animal where the calf is not to be absorbed.

7. Normal Reproductive Tract. Animals to be placed on a controlled breeding program should be examined so only animals with normal reproductive tracts are included on the program. Animals with an infected uterus, a uterus that has not involuted, or a free martin are not candidates for a controlled breeding program.

TABLE 3. HERD CYCLICITY IN VARIOUS BEEF TRIALS

Herd	Number In Herd	Number 50 Days P.P.	Number Cycling	% Of 50 Days P.P. Cycling
A	161	161	107	66.5
B	112	112	53	47.3
C	282	243	142	58.4
D	170	141	74	52.5
E	277	172	113	65.7
F	108	91	49	53.8
G	231	211	32	15.2
H	121	100	72	72.0
I	183	167	93	55.7
TOTAL	1,645	1,398	735	52.8

TABLE 4. A TYPICAL BEEF HERD USING PROGRAM A WITH A SINGLE FIXED TIME INSEMINATION[1]

	Without Palpation	With Palpation
Total animals in herd	282	282
Total over 50 days post-partum (P.P.)	243	243
Total animals cycling	142	142
Percent cycling over 50 days P.P.	58.4	58.4
Number cloprostenol injections	486	302
Number doses semen	243	151
Total number pregnant	81	81
Total cost cloprostenol and semen[2]	$3,888	$2,416
Cost vet. palpation[3]	0	365
Total cost	$3,888	$2,781

[1]See Table 5.

[2]Using $16.00 per head for cloprostenol and semen.

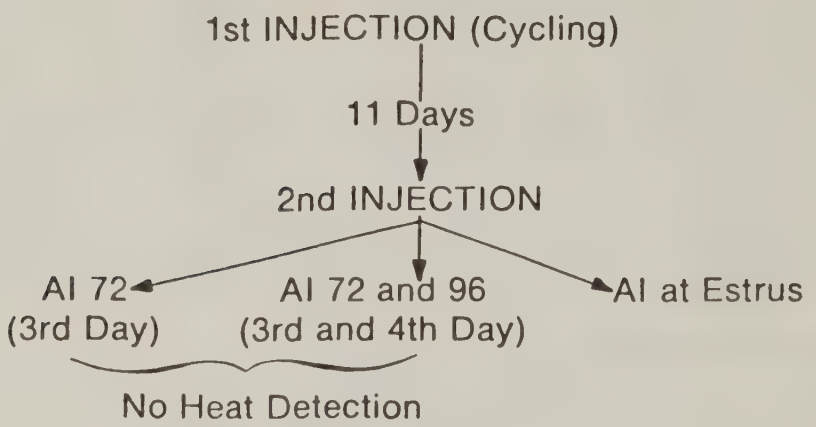
[3]Using $1.50 per head palpation fee on 243 animals.

Controlled Breeding Programs

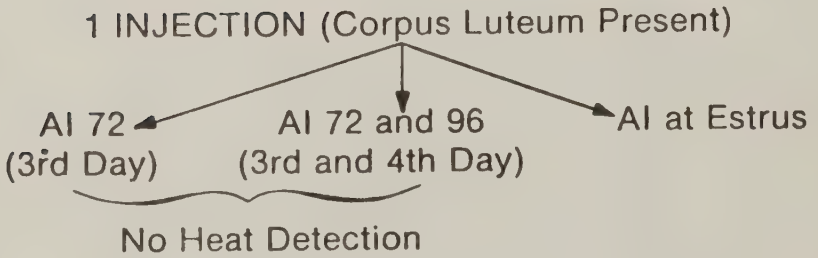
As previously discussed, each farm or ranch operates under different management practices and economic conditions. Because of these varying conditions and objectives, no single controlled breeding program will fit every condition or objective. For overall success, the specific controlled breeding program should be matched with the individual ranch requirements and objectives. ICI Americas, Inc., have been and are conducting trials with various breeding programs to allow the rancher as much flexibility as possible in choosing a program to meet his objectives. The following charts graphically illustrate the various controlled breeding programs utilized in field trial studies over the last three years (Tables 5 and 6).

TABLE 5. PROGRAM A, PROGRAM B, AND PROGRAM C

PROGRAM A



PROGRAM B



PROGRAM C

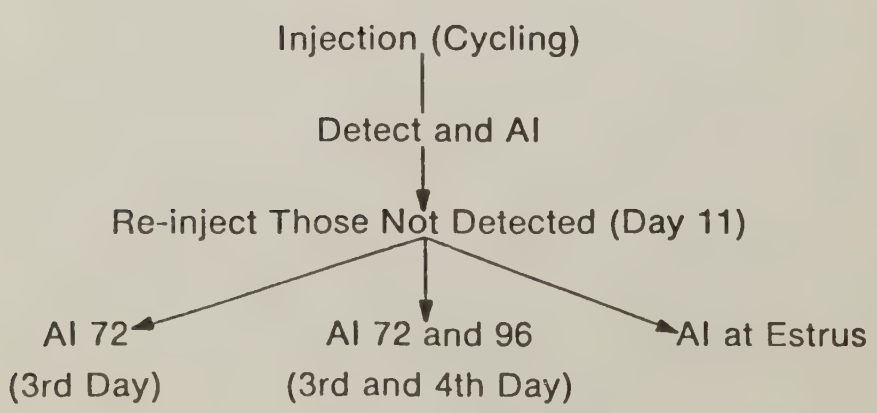
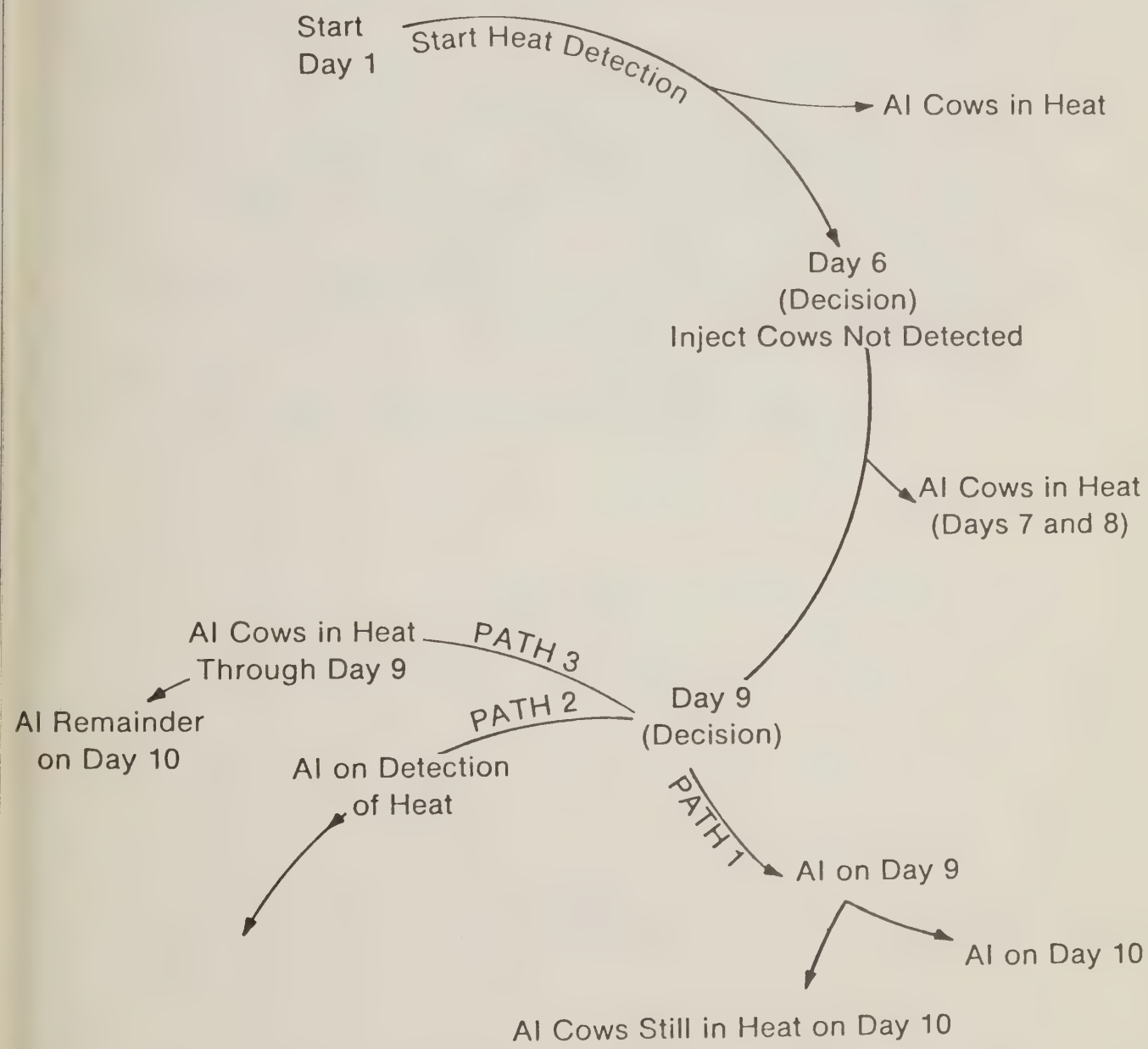


TABLE 6. PROGRAM D



Summary of Important Factors to Consider for Conducting a Planned Breeding Program

1. Establish breeding program objectives.

2. Select controlled breeding program that best fits the stated objectives.

3. Well-planned breeding coordination is essential to insure that events in the program take place at correct times.

4. Select only normal cycling animals for the breeding program.

5. Attention to details such as handling facilities, semen quality, AI techniques, and recordkeeping is essential.

6. Assess the results of the breeding program to help determine how succeeding programs may be changed or improved to meet objectives.

7. Re-evaluate program objectives prior to each breeding season.

ooOoo

BEEF MANAGEMENT SYSTEMS

Increasing the productivity and thus profitability of a cow-calf operation requires that each year the total pounds of calf produced be maximized. This goal requires that every breeding cow in the herd come into heat and conceive early in the breeding season and, thus, calve and wean a heavy, growthy calf each year.

In order to assist producers meet the challenge of improving production, American Breeders Service (ABS) has developed a program called Beef Management Systems (BMS). The primary objective of this program is to help producers by projecting future reproductive performance for their cow herds based on information collected prior to the breeding season. In particular, this program projects the number of cows, first-calf heifers, and virgin heifers that are expected to cycle and become pregnant during any given breeding season. Together with recommendations made for increasing herd efficiency, nutrition, health needs, heat detection, facilities, and sire recommendations, this information provides the basis for producers to make more objective management decisions.

I would like to share with you the mechanics of this program.

Herd Profile

The BMS program is initiated between the rancher and ABS by the use of a Herd Profile. (See Example Profile.) The profile is used to collect information on a herd's present level of production and management. I would like to emphasize the accuracy of this information is crucial to insure an accurate evaluation of a herd.

First on the Herd Profile is basic information about the ranch including names, addresses, and phone numbers.

The production history of the herd is then entered. This information is later used to measure the herd's productivity. The total number of cows and first-calf heifers, as well as virgin heifers and bulls, that were on hand the previous calving season are entered. Also included are the number of calves weaned and their average weaning weight.

A cattle inventory including the number of cows and first-calf heifers within each breed are indicated. These cattle represent those that will be bred in the forthcoming breeding season.

Presented by Tom Price, Manager, Beef Management Systems, American Breeders Service Division, DeForest, WI, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

Virgin heifer data is entered and includes their breed, age, and estimated weight at the start of the breeding season. The accuracy of this information is critical, as each of these criteria will affect the projected number that will cycle during the breeding season.

The actual and/or projected calving dates for the cows and first-calf heifers are then tabulated. If the profile is completed prior to the end of the calving season, these dates may be projected by using previous breeding and pregnancy diagnosis records. Again, care must be taken to be as accurate as possible.

The expected date to begin the breeding season is entered for the cows, first-calf heifers, and the virgin heifers.

Information concerning immunization of the herd is also requested. As we all know, a disease-free herd is mandatory for satisfactory performance.

Adequate nutrition is essential for optimum cycling and pregnancy rates. The present level of available feed, including types and acres of pasture and supplementation of various nutrients, is requested.

The body condition of the breeding herd is an indication of proper nutrition and health. If cows are thin, they will not function to their potential. Indication of the condition of the cattle prior to and after calving is requested.

General information is also collected and is helpful in familiarizing ABS with the operation as well as identifying future needs for manpower, facilities, and heat detection techniques.

Of particular importance, information regarding the breed(s) of cattle to be used in the future and the breeding objectives of the ranch are useful to ABS in supplying the producer with breeding recommendations.

Upon completing the profile, it is mailed to ABS for processing. The herd analysis is produced and then returned to the ABS Representative for delivery and discussion with the producer.

Production Evaluation (Figure 1)

The first computation made is a Production Evaluation of the herd. This evaluation relates to the previous year's calf crop.

The number of Animal Units are added. These figures represent the Producing Units--cows and first-calf heifers--and total Animal Units, including all cows, heifers, and bulls. In this example, there are 440 Producing Units and 522 Animal Units.

We first calculate the Percent Calf Crop. This figure reflects the number of calves produced from the number of producing units--the cows and first-calf heifers that were on hand during last year's calving season. A high percent calf crop reflects good reproductive management of the breeding herd and care of their calves up to weaning. (We have used an example of 387 calves weaned from 440 Producing Units = 88 percent calf crop.)

The total pounds of calf produced is calculated by multiplying the number of calves by the average weaning weight or market weight. This figure is used to make further calculations.

The Pounds of Calf Produced per Producing Unit is used to measure both genetic and managerial improvement of the breeding herd. Given similar environmental conditions, rainfall, etc., the pounds/ Producing Unit should improve each year.

The Pounds of Calf Produced per Animal Unit measures the total herd productivity which includes virgin heifers and bulls. An increase in the number of replacements and/or bulls must be accompanied by increased production to show equal production per Animal Unit. Raising virgin heifers and maintenance bull costs are high; and, therefore, this figure represents their addition to the formula.

The dollars generated per Animal Unit reflects profitability. The producer enters the market value of the calves when sold and multiplies this by the pounds produced per Animal Unit. This figure should be compared with the production costs per Animal Unit. Is the cattleman producing at the highest profitability?

We emphasize the producer can increase his total production and profitability by using BMS as a tool to improve:

1. Percent Calf Crop.
2. Percent Early Calving Cows.
3. Growth Rate of the Calves.
4. Quality of the Calves to Bring a Premium Price.

Reproductive Projections

The next section we come to in the analysis is the reproductive projections we make for the herd. In these analyses, we divide the cows and first-calf heifers into calving groups, or age groups if

they are heifers. We then project the number that should be detected in heat and, thus, be bred during the breeding season.

Cows (Figure 2)

The projections are first made for the cows.

Information from the example Herd Profile is used to demonstrate the way the system operates. Figure 2 represents this herd of 370 cows that calved between March 1 and June 1. Group 1 is those cows that calved in the 1st 21 days of the calving season or between March 1 and March 21. Group 2 would, therefore, be those cows that calved from March 22 to April 11. Group 3 would be the third 21 days and so on. There are 114 cows in Group 1, 63 in Group 2, 75 in Group 3, etc.

The breeding of this herd begins on May 28. We then project 63 days past this date to calculate three 21-day breeding periods.

In the section designated "2," the detection and pregnancy rates are shown for the first 21 days of breeding for each group of cows.

At the end of the first 21 days of breeding, the Group 1 cows have had 88 to 108 days of rest after calving. This means that given adequate nutrition, 95 percent of them or 108 cows should cycle (95 percent x 114 = 108 cows in heat). With a first service pregnancy rate of 68 percent, we should have 73 cows pregnant in the first 21 days (68 percent x 108 = 73 cows pregnant).

The Group 2 cows had fewer days rest after calving; thus, 90 percent or 57 cows are cycling. Therefore, 39 of the total 63 are pregnant in the first 21 days.

Continuing on into the second 21 days of breeding (section 3), we find no additional new, first service cows coming into heat for Group 1. We assume 5 percent of the cows will not cycle and eventually will be culled. Therefore, all the cows in heat in Group 1 are repeat cows. Thus, they are found in the Category of Detection--2nd Service.

(The 35 cows in heat are derived from subtracting the number pregnant from the number detected in heat the first 21 days, 108-73 = 35). In Group 1, 24 additional cows are pregnant (68 percent x 35 = 24).

In Group 2, an additional 5 percent of the cows are cycling; therefore, there are 3 new cows in heat (95 percent x 63 = 60-57 = 3). There are also 18 repeat-service cows. Therefore, the number of pregnant cows in Group 2 has increased by 14.

In the third 21 days, the same procedures are followed. In Group 1, all cows are now being serviced for their third time. We have assigned a reduced pregnancy rate of 50 percent for these cows; therefore, we have a total of 73 cows (1st 21 days) plus 24 cows (2nd 21 days) plus 6 cows (3rd 21 days) pregnant in Group 1 in the 63-day breeding season. All of Group 2 cows are repeats; however, some are second service; and some are third service. The computations thus show us there are 39 cows (1st 21 days) plus 14 cows (2nd 21 days) plus 3+1 cows (3rd 21 days) pregnant in Group 2 in the 63-day breeding season.

These computations are totaled for the entire cow herd across each calving group or column; and thus, we determine the total number of cows that should be detected in heat and become pregnant during each 21-day period.

In this herd, for example, there are a total of 370 cows. In the first 21 days, we estimate 256 to be in heat and 163 to become pregnant. This amounts to 44 percent of the cow herd pregnant in the first 21 days.

At the start of the second 21 days, there are 207 open cows. We should detect approximately 151, and 98 should become pregnant. This is an increase of 26 percent. In 42 days, these figures represent 261 or 70 percent of the cow herd pregnant.

At the start of the third 21 days, 109 remain open. Eighty-two should be detected in heat, and 50 or 13 percent additional cows should become pregnant.

In total, in the 63-day breeding season, 311 of the 370 cows should become pregnant if they have received adequate nutrition. This represents 84 percent of the cows. This means, of course, that 16 percent of the cows are subject to culling or, if necessary, continued breeding.

Projected Heat Detection--Cows (Figure 3)

Figure 3 represents the average number of cows that should be detected in heat during the three 21-day breeding periods. In the first 21 days of breeding, we would expect in this example herd to find approximately 12.1 cows in heat each day. If the number detected is significantly below what is projected, a review of the heat detection method is in order. If heat detection is adequate and still fewer cows are cycling, it may be due to inadequate nutrition or disease.

In the second 21 days, the detection rate has decreased to 7.1 per day; and by the third 21 days, the number of cows has dropped to only 3.9.

This chart is helpful in determining how many days to breed A.I. and also to determine your progress through the A.I. program. Many producers find it helpful to plot their actual results right on the chart.

First-Calf Heifers

The next section of the BMS packet is concerned with the first-calf heifers. We compute the same projections for them as we do with the older cows. The projections are separated because first-calf heifers function differently than cows. On the average, they are slower to show heat after calving; and, therefore, the percentages we use are slightly lower.

First-calf heifers are slower to come into heat because they are undergoing the stress of suckling their first calf and, at the same time, attempting to maintain their own growth. This has an adverse affect on their returning to heat and becoming pregnant soon after calving. In many instances, first-calf heifers will require additional feed and more days rest after calving. In order to assure they get this additional rest, we recommend breeding them as virgin heifers several weeks prior to the cow herd.

We also suggest the first-calf heifers be managed separately from the older cows. In this way, they don't have to compete with the older, bossy cows that push the younger cattle away from the feed bunk.

Virgin Heifers (Figure 4 and Figure 5)

The virgin heifer section stresses proper management at various stages of maturity.

1. Heifers need to be adequately fed so they will reach the necessary weight for puberty and, thus, be able to cycle early in the breeding season.

2. Accurate identification and performance records are also necessary to maintain a planned breeding program.

3. The superior-performing heifers are ordinarily selected at weaning to be included in the breeding program.

4. After breeding, cull all heifers that have not cycled or become pregnant during the breeding season.

5. If possible, select those heifers that have larger pelvic openings to enter the herd. This should reduce some of the possible hard calvers.

6. Be sure to breed the virgin heifers to bulls known to sire small calves at birth.

7. At calving time, it is important to record calving traits and cull all heifers that have had severe calving problems. It is then important to follow the recommendations set forth for breeding first-calf heifers.

Projections for the percent of virgin heifers that should cycle and become pregnant during the breeding season are based on their breed, their age and weight at the start of breeding, and their weight gain from weaning through breeding. Factors such as genetic makeup, climate, and other management influences can affect the onset of puberty; however, these factors are not identifiable and, therefore, cause certain unaccountable variations.

The reproductive worksheet (Figure 4) is very similar in appearance to the cow and first-calf heifer worksheets, except that instead of calving groups we have them divided into age groups ranging from 365 to 485 days of age. The weights of the heifers are not printed on the worksheet but are used in the projections.

This particular example herd represents a total group of 70 Angus heifers that range in age from 365 to 446 days at the start of breeding. There are 30 heifers in Group 3, and they represent those heifers that are 14 months of age at the start of the first 21 days of breeding and weigh 700 pounds. Group 4 heifers, of which there are 20, are 13 months of age and weigh 650 pounds. Group 5 are 12 months of age and weigh 600 pounds at the start of breeding.

The computations demonstrate the same technique we used when we calculated the projects for the cows and first-calf heifers. That is, in Group 3 we calculate 88 percent cycling or 26 heifers in heat. Using a first service pregnancy rate of 65 percent, we find 17 becoming pregnant in the first 21 days. The Group 4 heifers are not as old or as heavy; and, therefore, fewer of them are cycling at the end of the first 21 days. Seventy-nine percent or 16 should be in heat, with 10 becoming pregnant. The same procedures are followed in Group 5.

In the second 21 days, the heifers are 21 days older and approximately 21 pounds heavier (1 lb./head/day gain). Therefore, they should cycle at a higher rate than before.

There are 13 open heifers in Group 3 and 10 in Group 4. The Group 3 heifers have now increased to a 95 percent cycling rate and Group 4 to 84 percent.

As with the cows, some of the heifers did not become pregnant from the first service; and, therefore, we have some repeat breeders.

Including first and second service heifers, there are 8 additional pregnant in Group 3 and 5 additional pregnant in Group 4.

In the third 21 days, the heifers are once again older and heavier. There are 5 open heifers in each group. We find no new heifers in Group 3 cycling. Therefore, all Group 3 heifers in heat are repeat breeders. In Group 4, there is one new heifer in heat because of the increased cycling percentage. Two additional heifers in each group have become pregnant.

When we total all the age groups of heifers, we find 56 of the total 70 heifers cycled in the first 21 days. Thirty-six became pregnant accounting for 51 percent of the heifers.

In the second 21 days, there were 34 open heifers; 25 cycled, and 17 became pregnant--an addition of 24 percent. After 42 days of breeding, 53 heifers or 75 percent are pregnant.

At the end of 63 days, there should be 59 pregnant heifers or 84 percent pregnant of the total 70 heifers.

The heat detection chart (Figure 5) shows an average of 2.6 heifers in heat each day during the first 21 days of breeding. This number is reduced to 1.1 for the second 21 days and to less than 1 in the last 21 days.

These Reproductive Projections are most valuable in planning a breeding program. By combining the cow and heifer's projections, the producer can determine:

1. The most optimum breeding dates.

2. The number of cattle to be included in the A.I. program.

3. The expected number of cattle that will be culled because they fail to become pregnant.

4. The heat detection method to use, including the number of heat detector animals or other aids.

5. The number of personnel necessary.

6. The amount of semen to order and have on hand.

7. Most important, the projections give the producer a guideline to follow in determining his progress or failure.

Summary

At American Breeders Service, we feel it is our obligation to help our customers plan and conduct successful breeding programs. This goes beyond supplying them with quality semen from genetic leader bulls; it requires that we work with producers in their total management effort. We provide careful guidance to our customers through the Beef Management Systems program to enable them the opportunity to reap the greatest harvest from their A.I. efforts. This strengthens not only our customer's position and ABS but, most importantly, the concept that A.I. is a practical and effective method to make rapid genetic progress.

In reference to this conference, I extend my appreciation for the many opportunities ABS has had to work with this country's leading Extension specialists. We welcome the opportunity to continue in our efforts to educate cattlemen on the merits of good reproductive management and sound breeding programs.

ooOoo

EXAMPLE OF HERD PROFILE

American Breeders Service

DeForest, Wisconsin 53532

HERD PROFILE

Ranch Name: XH LAND & CATTLE Ranch Phone: Area Code: 405 No.: 826-3721

Customer Name: L.W. HARRIS Date: 4/1/77

Address - Street or Route: ROUTE 2 City: SARATOGA State: OK/A Zip: 72106

Rep. Name: Rep. Number: Rep. Phone:

HERD HISTORY – PRODUCTION DATA
(Enter number of animals on hand during last year's calving season)

No. of Cows and First Calf Heifers: 440 No. of Virgin Heifers (Yearlings): 84 No. of Bulls: 10

Number of Calves Weaned: 387 Average Weaning Weight: 410

CATTLE INVENTORY – THIS BREEDING SEASON

COW & 1ST CALF HEIFER INVENTORY

Breed	No. Cows	No. 1st Calf Heifers
ANGUS	370	65

VIRGIN HEIFERS INVENTORY – HERD REPLACEMENTS
(Enter No. & Avg. Wt. of Each Age Group at Start of Breeding)

Breed	12 Mo.	13 Mo.	14 Mo.	15 Mo.	16 Mo. or More
ANGUS	No. 20 Avg. Wt. 600	No. 20 Avg. Wt. 650	No. 30 Avg. Wt. 700	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___
	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___
	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___
	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___	No. ___ Avg. Wt. ___

CALVING DATES

	Start Date	Date ¼ Calved	Date ½ Calved	Date ¾ Calved	DATE ALL CALVED
Cows	3-1-77	3-15	4-15	5-10	6-1-77
1st Calf Heifers	3-15-77	4-1	4-20	5-10	6-1-77

BREEDING DATES

Date to Start Cows & 1st Calf Heifers: 5 / 25 / 77 Date to End: 8 / 1 / 77

Date to Start Virgin Heifers: 5 / 7 / 77 Date to End: 7 / 9 / 77

NUTRITION AND HEALTH

Types and Acres of Pasture: 5,000 acres native pasture

Feed Supplements: Alfalfa hay Mineral & Vitamins: Phosphorus - ADE

Vaccination Program used: Cows: IBR, LEPTO Calves: BLACKLEG

Condition of cows at calving: Fat ( ) Good (X) Thin ( ) At Breeding: Fat ( ) Good (X) Thin ( )

Condition of 1st calf heifers at calving: Fat ( ) Good (X) Thin ( ) At Breeding: Fat ( ) Good (X) Thin ( )

GENERAL INFORMATION

No. Ranch Personnel: 4 A.I. Experience: 0 yrs. Trained by: ABS School - 1977

Type of Herd ID (now used): BRAND Heat Detection system used in the past: —

Facilities Available: Breeding Chute: OK Detection Area: 2 pastures Corrals: OK Others:

Breeds of Interest: ANGUS Breeding Objectives: Shorten calving season

SAL-326-476 Printed in U.S.A.

FIGURE 1. PRODUCTION EVALUATION

XH LAND & CATTLE

THE PRODUCTION EVALUATION IS A SYSTEM TO MEASURE YOUR HERD'S PROGRESS YEAR AFTER YEAR. SEVERAL MEASURES ARE USED TO EVALUATE PRODUCTIVITY. EACH MEASURE WILL INCREASE WITH IMPROVEMENT IN HERD MANAGEMENT AND GENETIC QUALITY. THREE FACTORS ARE USED IN CALCULATING THIS EVALUATION. THEY ARE - -

1. THE NUMBER OF ANIMALS WHICH WERE PRESENT IN THE HERD DURING THE PREVIOUS BREEDING SEASON. THIS INCLUDES COWS, FIRST-CALF HEIFERS, VIRGIN HEIFERS AND BULLS.

2. THE NUMBER OF CALVES WEANED FROM THE COWS AND FIRST-CALF HEIFERS.

3. THE AVERAGE ACTUAL WEANING WEIGHT OF THE CALVES.

THE EVALUATION IS CALCULATED BELOW

INVENTORY			PRODUCTION
440 COWS AND 1ST CALF HEIFERS	X 1.0 AU =	440 PRODUCING UNITS (PU)	PERCENT CALF CROP = 387 (NO. CALVES) / 440 (NO. PU) = 88
84 VIRGIN HEIFERS	X 0.8 AU =	67	
10 BULLS	X 1.5 AU =	15	TOTAL LBS CALF PRODUCED = 387 (NO. CALVES) X 410 (AVE. WGT.) = 158,670
TOTAL		522 ANIMAL UNITS (AU)	LBS. PRODUCED PER PRODUCING UNIT = 158,670 (TOTAL LBS. CALF) / 440 (NO. PU) = 360
			LBS. PRODUCED PER ANIMAL UNIT = 158,670 (TOTAL LBS. CALF) / 522 (NO. AU) = 304
			CALF DOLLARS GENERATED = 304 (LBS. PER AU) X $ * (AVG. MARKET VALUE) = $

* ENTER THE AVG. MARKET VALUE OF THE CALVES AT TIME OF SALE TO CALCULATE THE CALF DOLLARS GENERATED PER ANIMAL UNIT. HOW DOES THIS FIGURE COMPARE WITH YOUR PRODUCTION COSTS PER AU.

YOU CAN INCREASE THE CALF DOLLARS GENERATED BY INCREASING - 1. PERCENT CALF CROP.
2. PERCENT OF EARLY CALVING COWS.
3. GROWTH RATE OF THE CALVES.
4. QUALITY OF THE CALVES TO BRING PREMIUM PRICES.

MAKING THESE IMPROVEMENTS CAN BEST BE REALIZED BY APPLYING THE MANAGEMENT INFORMATION CONTAINED WITHIN YOUR BEEF HERD MANAGEMENT PROGRAM.

FIGURE 2. REPRODUCTIVE PROJECTIONS -- COWS

XH LAND & CATTLE — COWS — AMERICAN BREEDERS SERVICE

1. HOW THEY CALVE — CALVING DATES 03/01/77 TO 06/01/77 NO. DAYS = 92

DAYS	Group 1 1st 21 Days	Group 2 2nd 21 Days	Group 3 3rd 21 Days	Group 4 4th 21 Days	Group 5 5th 21 Days	TOTAL AVAILABLE
COWS CALVING	114	63	75	84	34	370

BREEDING FROM 05/28/77 to 07/30/77 NO. DAYS = 63

2. HOW THEY PERFORM — FIRST 21 DAYS OF BREEDING						1ST 21-DAYS TOTAL (EST)	1ST 21-DAYS PERCENT PREGNANT
DAYS REST/GROUP	88 TO 108	67 TO 87	46 TO 66	25 TO 45	4 TO 24		
NO. COWS	114	63	75	84	34	370	
DETECTION 1STSER	95 = 108	90 = 57	76 = 57	40 = 34	00 = 0	256	
PREGNANCY 1STSER	68 = 73	68 = 39	65 = 37	40 = 14	00 = 0	163	44

3. HOW THEY PERFORM — SECOND 21 DAYS OF BREEDING						2ND 21-DAYS TOTAL (EST)	2ND 21-DAYS PERCENT PREGNANT	42 DAYS PREGNANT TOTAL	42 DAYS PREGNANT PERCENT
DAYS REST/GROUP	109 TO 129	88 TO 108	67 TO 87	46 TO 66	25 TO 45				
NO. COWS	41	24	38	70	34	207			
DETECTION 1ST SER	95 = 0	95 = 3	90 = 11	76 = 30	40 = 14				
DETECTION 2ND SER	100 = 35	100 = 18	100 = 20	100 = 20	100 = 0	151			
PREGNANCY 1ST2ND	68 = 24	68 = 14	68 = 21	65 = 33	40 = 6	98	26	261	70

4. HOW THEY PERFORM — THIRD 21 DAYS OF BREEDING						3RD 21-DAYS TOTAL (EST)	3RD 21-DAYS PERCENT PREGNANT	63 DAYS PREGNANT TOTAL	63 DAYS PREGNANT PERCENT
DAYS REST/GROUP	130 TO 150	109 TO 129	88 TO 108	67 TO 87	46 TO 66				
NO. COWS	17	10	17	37	28	109			
DETECTION 1STSER	95 = 0	95 = 0	95 = 4	90 = 12	76 = 12				
DETECTION 2NDSER	100 = 11	100 = 7	100 = 10	100 = 18	100 = 8	82			
PREGNANCY 3RDSER	50 = 6	50 = 3	50 = 3	50 = 4	50 = 0				
PREGNANCY 1ST2ND	68 = 0	68 = 1	68 = 5	68 = 15	65 = 13	50	13	311	84

							NOT PREGNANT TOTAL	NOT PREGNANT PERCENT
NO. NOT BRED	11	6	9	18	15		59	16

FIGURE 3. PROJECTED HEAT DETECTION

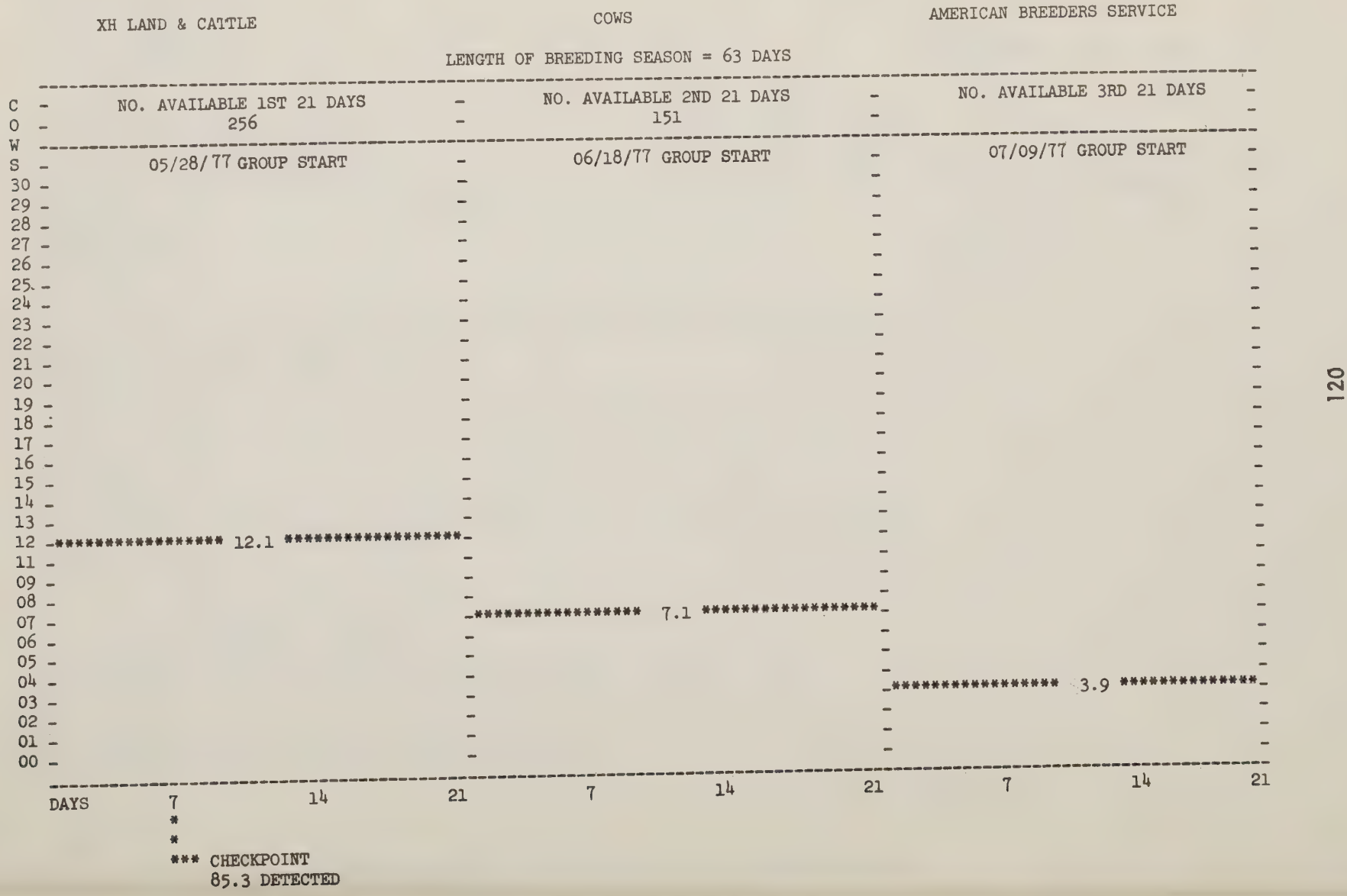


FIGURE 4. HERD PROFILE WORKSHEET -- VIRGIN HEIFERS

XH LAND & CATTLE — VIRGIN HEIFERS — AMERICAN BREEDERS SERVICE

ANGUS

1. RANGE IN AGE — DAYS OLD 365 TO 485

DAYS OLD/GROUP	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5	TOTAL
VIRGIN HEIFERS	486 TO 506	456 TO 476	426 TO 446	395 TO 415	365 TO 385	
	NONE AVAILABLE	NONE AVAILABLE	30	20	20	

BREEDING FROM 05/07/77 TO 07/09/77 NO. DAYS = 63

2. HOW THEY PERFORM — FIRST 21 DAYS OF BREEDING

DAYS OLD/GROUP	486 TO 506	456 TO 476	426 TO 446	395 TO 415	365 TO 385	1ST 21-DAYS TOTAL (EST)	1ST 21-DAYS PERCENT PREGNANT
NO. HEIFERS			30	20	20	70	
DETECTION 1ST SER			88 = 26	79 = 16	72 = 14	56	
PREGNANCY 1ST SER			65 = 17	65 = 10	65 = 9	36	51

3. HOW THEY PERFORM — SECOND 21 DAYS OF BREEDING

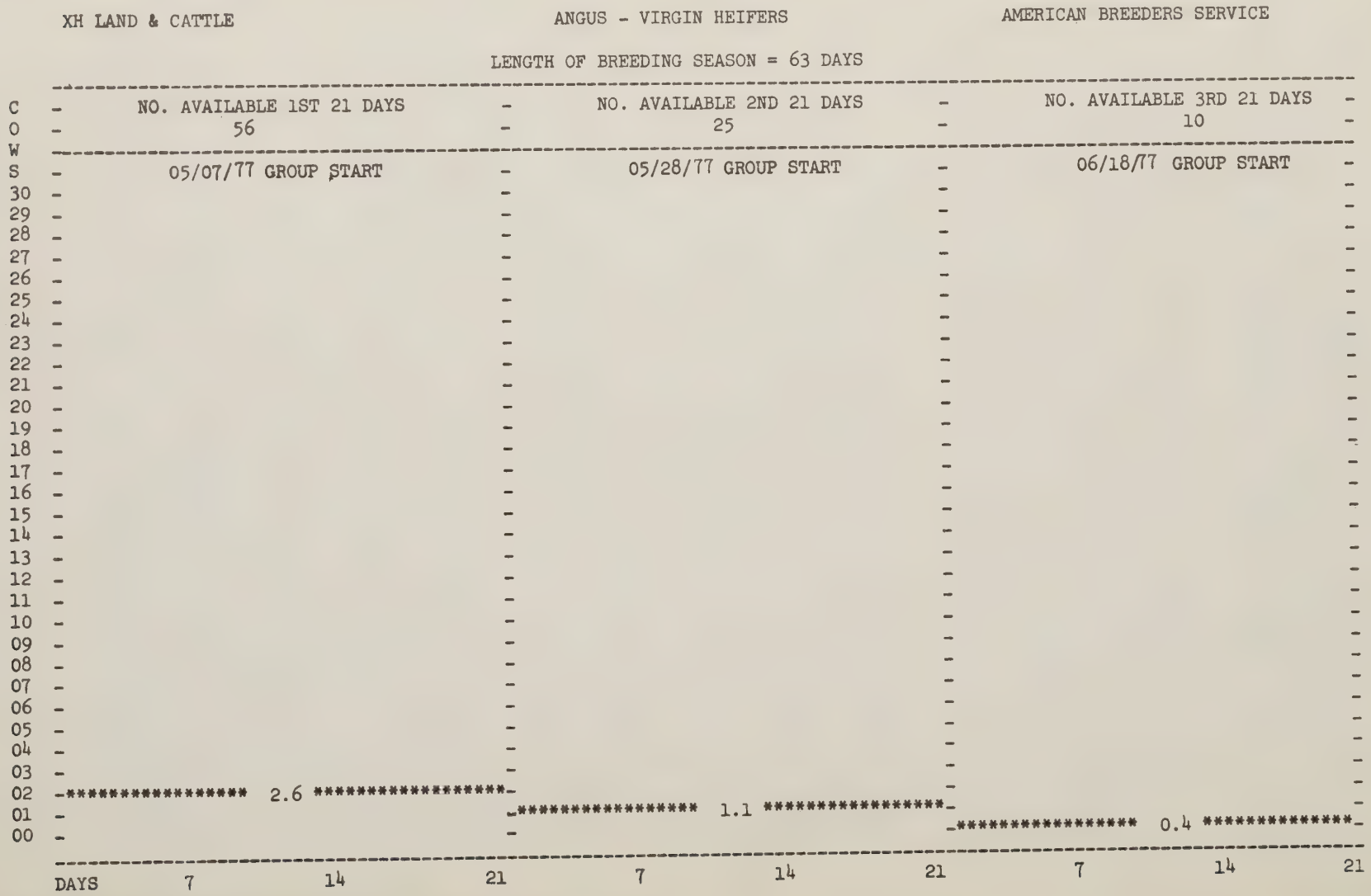
DAYS OLD/GROUP	507 TO 527	477 TO 497	447 TO 467	416 TO 436	386 TO 406	2ND 21-DAYS TOTAL (EST)	2ND 21-DAYS PERCENT PREGNANT	42 DAYS PREGNANT TOTAL	42 DAYS PREGNANT PERCENT
NO. HEIFERS			13	10	11	34			
DETECTION 1ST SER			95 = 3	84 = 1	77 = 1				
DETECTION 2ND SER			100 = 9	100 = 6	100 = 5	25			
PREGNANCY 1ST2ND			65 = 8	65 = 5	65 = 4	17	24	53	75

4. HOW THEY PERFORM — THIRD 21 DAYS BREEDING

DAYS OLD/GROUP	528 TO 548	498 TO 519	468 TO 488	437 TO 457	407 TO 427	3RD 21-DAYS TOTAL (EST)	3RD 21-DAYS PERCENT PREGNANT	63 DAYS PREGNANT TOTAL	63 DAYS PREGNANT PERCENT
NO. HEIFERS			5	5	7	17			
DETECTION 1STSER			95 = 0	88 = 1	80 = 1				
DETECTION 2NDSER			100 = 4	100 = 2	100 = 2	10			
PREGNANCY 3RDSER			50 = 2	50 = 1	50 = 1				
PREGNANCY 1ST2ND			65 = 0	65 = 1	65 = 1	6	09	59	84

						NOT PREGNANT TOTAL	NOT PREGNANT PERCENT
NO. NOT BRED	0	0	3	3	5	11	16

FIGURE 5. PROJECTED HEAT DETECTION -- ANGUS-VIRGIN HEIFERS



FEED INDUSTRY ROLE IN REPRODUCTIVE MANAGEMENT

I have been asked to speak to you about (1) feed industries' views on the problems and opportunities in beef cattle reproductive management, (2) feed industries' views on their role in solving these problems, and (3) capitalizing on opportunities in this area; how can our industry cooperate with other segments of the beef industry to improve reproductive management.

One of the major problems facing cow-calf producers is costs of reproductive management and production, in general.

One major factor in these costs is labor. Feed companies can assist at this point by delivering bulk supplements or if the cow-calf man doesn't have bulk handling facilities, feed companies can assist in designing and financing these facilities. Bulk range feeds cost between $10 to $14 per ton less than bagged feeds. Blocks, salt or fat, and liquid self-limiting supplements may work satisfactorily for some situations. In order for the cow-calf man to evaluate various liquid supplements, moisture levels should be included on the tag. Crude fiber levels give a good indication of energy levels in dry feeds--moisture would do the same for liquids.

In the West Texas, New Mexico, and Western Oklahoma area and a large area of the United States, proper forage supplementation is necessary for obtaining the most economical herd reproduction levels. Feed companies can assist at this point by working with Extension and research personnel in obtaining better nutritional data on the forages available, by designing supplements that supply the nutrients needed, and by supplying adequate information about these supplements so the cow-calf producer can decide which supplement will be the best buy.

We have made an attempt to formulate adequate range supplements by using linear programming to least-cost a complete range feed; including native grasses, cottonseed meal, sorghum, corn, 17 percent alfalfa, molasses, minerals, and vitamin A are added for supplemental ingredients for natural protein supplements. Urea and ammonium sulfate are added for supplements containing NPN. For the following example nutrient levels used to meet "all" requirements were: TDN, 51 percent; digestible protein, 5.4 percent; phosphorus, 0.22 percent; potassium, 0.6 percent; and sulfur, 0.1 percent. Nutrient

---

Presented by Raymond Hinders, Animal Nutritionist, Producers Grain Corporation, Box 32110, Amarillo, TX, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

composition is given in Table 1. Vitamin A is added to the cubes at 20,000 IU per pound. The supplement portion of this ration to balance requirements for native grass contained 18 percent crude protein and 72 percent TDN. Due to problems of cubing a 72 percent TDN (very high grain pellet), lower energy levels are used in our commercial cubes to reduce fines. However, it is very obvious that energy level in range cubes is an important factor and contributes very significantly to their value for the cow-calf producer.

TABLE 1. NUTRIENT VALUES OF RANGE FEEDS

	D.P.	TDN	P	K
Grama & Buffalo Grass	2.0	45.0	0.1	0.2
17 Percent Alfalfa Cube	12.6	55.0	0.2	2.8
41 Percent Sol. Cottonseed Meal	36.0	68.0	1.2	1.45
30 Percent Protein, 24 Percent Fiber Sunflower Meal	27.0	45.0	1.0	0.7

Table 2 indicates the opportunity costs or equal value prices of various range supplements for cows with calves on native blue grama, buffalo grass pastures.

TABLE 2. EQUAL VALUES OF VARIOUS RANGE SUPPLEMENTS FOR COWS WITH CALVES

	Cost/Ton	
	(a)	(b)
PGC 18 Percent Hi Energy Cube (8.0 Percent Fiber)	$133.60	--
PGC 20 Percent Breeder Cube (8.5 Percent Fiber)	122.60	$136.00
PGC 20 Percent N.P. Range Cube (12.5 Percent Fiber)	106.80	118.00
20 Percent N.P. Cube (15 Percent Fiber)	83.20	90.80
PS 20 Percent Equivalent Cube (7.5 Percent Fiber)	120.60	--
PGC 32 Percent N.P. Cube	134.60	149.60
PGC 32 Percent Equivalent Cube	108.20	119.60
Cottonseed Cake	144.60	161.20
Dehy Alfalfa Cube	77.80	84.60
Sunflower Cube - 30 Percent Crude Protein, 25 Percent Fiber	30.00	30.00

(a) Values in this column are based on the use of PGC 18% Hi Energy Cubes to meet all requirements.
(b) Values in this column are based on the use of PGC 20% Breeder Cubes to meet all requirements (the 18% Hi Energy Cube was not allowed as an alternative).

If the 18 percent protein High Energy cube delivers for $133.50, the lower energy 20 percent Breeder cube would be worth $122.60; and cottonseed cake would be worth $144.60. This 18 percent High Energy cube has been used for 3 years now with good success in our area; but if a 20 percent protein cube is desired and a delivered cost of $136.00 is used for the 8.5 percent fiber cube, the equal value price for the 20 percent protein, 12.5 percent fiber cube is $118.00. For the 20 percent protein, 15 percent fiber cube is $90.80. What this is telling us is, it is cheaper to supply the fiber from range grass than from a manufactured cube. This is no surprise to anyone, but a number of ranchers pay no attention to it when they buy 20 percent cubes. (NOTE: Cottonseed cake would be a good buy compared to 20 percent Breeder cubes at $161.20.) Sunflower cubes with 25 percent fiber have a low value, because their energy content is extremely low.

These equal value prices should prove helpful to the cow-calf producer when he is shopping for best buys in range supplements. It allows him to include the total nutrient package and not just crude protein. "Buying Guides" that consider only protein lump all 20 percent protein cubes together and indicate that 41 percent cottonseed cake is worth twice as much as 20 percent protein cubes. We offer this service to our customers, and a number of other feed companies have this same capability.

A complete listing of nutrient values for commercial supplements is helpful to evaluate their worth in varying situations. Current values for PGC cubes are given in Table 3.

TABLE 3. 1978 CUBES

	Fiber	DP	TDN	P	K
18 Percent High Energy	6.9	14.7	67.0	.80	1.9
20 Percent Breeder	8.5	16.5	64.4	.90	2.0
20 Percent N.P. Range	12.5	16.4	61.2	.80	1.8
20 Percent CP--15% Fiber*	15.0	16.0	55.0	.80	1.0
20 Percent Equivalent	6.2	15.1	64.2	1.00	2.0
32 Percent N.P.	11.3	27.7	66.9	.95	1.8
32 Percent Equivalent	8.0	25.3	62.4	1.00	1.8

*We do not manufacture a 15% cube; it is given for comparison.

A number of companies analyze forages for mineral content as well as fiber and protein. We started doing this about 9 years ago to get phosphorus analyses. One of our suppliers, International

Mineral Company, ran these for us by spectographic analysis and reported calcium, potassium, magnesium, sulfur, iron, zinc, copper, and manganese. Phosphorus in our forages were inadequate, but it was surprising that the potassium levels in dormant grass (which may cover a period of 6 to 7 months in our area) were considerably below nutrient requirements of 0.5 percent for the cow with calf. Native grass showed the lowest phosphorus and potassium levels (Table 4) followed by love grass (Table 5) and edible forbes (Table 6).

TABLE 4. POTASSIUM, PHOSPHORUS, AND CALCIUM CONTENT OF BUFFALO GRASS AND BLUE GRAMA SAMPLED IN WEST TEXAS AND EASTERN NEW MEXICO

	POTASSIUM %	STD. DEV.	PHOSPHORUS %	STD. DEV.	CALCIUM %	STD. DEV.
Jan-Mar	.14	±.05	.05	±.02	.39	±.10
Apr-June (Green)	.37	±.05	.14	±.05	.34	±.08
Apr-June (Dry)	.14	±.06	.06	±.02	.44	±.18
July-Sept	.71	±.31	.12	±.07	.58	±.25
Oct-Dec	.27	±.10	.07	±.03	.42	±.20

TABLE 5. POTASSIUM, PHOSPHORUS, AND CALCIUM CONTENT OF LOVE GRASS

	POTASSIUM %	STD. DEV.	PHOSPHORUS %	STD. DEV.	CALCIUM %	STD. DEV.
Apr-June	1.06	±.46	.23	±.50	.5	±.18
Oct-Dec	.61	±.10	.07	±.01	.42	±.07

TABLE 6. POTASSIUM, PHOSPHORUS, AND CALCIUM CONTENT OF EDIBLE FORBES

	POTASSIUM %	STD. DEV.	PHOSPHORUS %	STD. DEV.	CALCIUM %	STD. DEV.
Apr-June	1.83	.51±	.18	.03±	.85	.24±
Oct-Dec	.77	.49±	.11	.06±	1.20	.52±

This information indicates that in our area minerals containing phosphorus and potassium need to be supplemented, especially during dormant grass periods.

Feed manufacturers are continually in the mineral market and are aware of the best buy in mineral sources. For range cattle, cost is ruling out the use of minerals containing more phosphorus than calcium. Phosphorus sources that have to be altered by manufacturing to reduce calcium levels are getting more expensive. (Phosphorus from defluorinated phosphate costs about half as much per pound phosphorus as from sodium tripoly phosphate.) It is not practical to recommend 2:1 or even 1:1 phosphorus to calcium ratio minerals when research indicated the 1:2 ratio works just as well.

It would be helpful for feed manufacturers to include mineral guarantees for winter range supplements. Table 7 indicates the variability in mineral content of various range supplements.

TABLE 7. POTASSIUM, PHOSPHORUS, AND CALCIUM CONTENT OF RANGE SUPPLEMENTS

	Cottonseed Meal	20% Natural Protein Cubes	17% Dehy Alfalfa
Potassium %	1.4	1.7	2.9
Range	1.5 - 1.3	1.2 - 3.3	1.8 - 3.9
Phosphorus %	0.9	0.6	0.2
Range	0.5 - 1.1	0.3 - 1.1	0.15 - 0.3
Calcium %	0.2	2.4	1.7
Range	0.17 - 0.24	0.9 - 4.5	1.4 - 1.9

It is interesting to note that the average phosphorus content of cottonseed meal we have received averaged 0.9 percent with a range of 0.5 to 1.1 percent. It is also interesting to note the variation in 20 percent cubes--particularly the high calcium content of one which also had the lowest phosphorus content.

Feed companies can make a good contribution to improvements in beef reproduction by manufacturing supplements that meet their area's needs and by informing customers about the nutrient value of these products. Salesmen are often well-informed about the products they sell and are regularly in communication with their company nutritionist. They are often fairly familiar with a wide range of operations and know of good practices and problems that exist in the field. Just by visiting their customers they could create a lot of interest in Extension programs to improve reproduction.

Calf crop percentage, grouping calves, etc., make excellent topics for company sponsored nutrition meetings for their customers. Feed companies will be interested and will support efforts to solve problems in reproduction management.

ooOoo

DISCUSSION OF CATTLE IDENTIFICATION

No record system can be of much value without a permanent identification of the individual animal involved. Since we started reproduction records in 1954 and artificial breeding in 1956, we have used quite a few methods of identification, including hot brand numbers, freeze brand numbers, and various makes and types of ear tags.

Since we breed in December and January for fall calves, we found the hot brand numbers hard to read in those months and found it was necessary to clip most of the brand in order to identify the cows. Freeze brands were unpredictable as to whether they would be good or not. I suppose our technique may not have been as good as necessary to get good brands every time.

We are now using a system of tattoos and ear tags for identification, with the tattoos serving as permanent identification. Good readable tattoos are essential to prevent losing the identity of animals. We find that by cleaning the ears with alcohol before tattooing, it helps to get that good, readable number. Probably, the whole thing about getting good tattoos is rubbing the ink in until all blood stops. We find about the only thing to use is a finger--brushes and roller just don't get the job done.

After we have all of our calves on the ground for the year, we assign a permanent number to each heifer calf, using a series from 1 to 999 along with a letter to designate the year born. In other words, we may start 1977 with A-1 and use numbers up to A-375 or whatever number of calves we have. In 1978, we would then start with B-376 to whatever number of calves we have, etc. We number all heifers consecutively by sire so we know the breeding on the cow's sire side by her number.

Tattooing is generally done when the calves are 4- to 5-months-old. At weaning time, we tag with large Richie tags, the same number as the heifers' tattoo which then becomes their permanent herd number. If a tag is lost, all we have to do is read the tattoo to know the cow's number. At the time we put in the ear tags, we check the tattoos to be sure we have a readable number.

Presented by Dale Engler, Ramsey Ranch, Eldorado, KS, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-Nov 1, 1978.

Cows are sorted into groups according to calving date and age. All 2- and 3-year-old cows are wintered separately from the mature cows. The calving groups put in various pastures usually number from 100 to 125 head. We make up tags for each calf for each pasture ahead of calving. We use ear tags with the same number as the cow. The tags are color coded for sire of the calf.

At calving time, the men carry the tags for each pasture in saddle bags when they ride the pastures. As each calf is found, they ear tag it with its mother's number and record the number, date, sex, sire of the calf, weight (if we weigh the calf), and pasture. This information is recorded on the following calving card.

1977

CALVING CARD — Calf Crop — PG. 33

Cow No.	Date Born	Sex	Sire	Remarks	
M679	9/25	H	MA03	64H	SO
M395	1	H	MA03		SS
X311	26	B	1883	60H	SO
M363		B	MA03		SS
R207		H	1883		MC
R631		B	MA20		MC
T15		B	E4		SE
T589		H	E4		SE
X145		H	1883		SE
C253	✓	B	T24	P2 95	NE
X231	27	H	353	64	SO
T108	1	H	U523	P2 84	SI
E31	✓	B	MA08	P2 104	L
M263		B	MA08	P3 102	OP
C462		H	MA01	P3 100	NB
C413		B	MA01	98	NB
B588		B	T20		MC
C12		B	MA20		MC
R625		B	MA20		MC
C316	✓	H	E4		NB

618

A copy of the calving card is sent to the office, where the information is recorded in a calving book--which is made up ahead of time for the whole cow herd. This record with the left-hand side filled out at calving time is shown below. Under the date born, the top number is the days of gestation which we have found averages about 274 days for Angus heifers, 279 days for Angus cows, and 282 days for Maine-Anjou crossbred cows. This may not be a true picture; we use induced calving on the Maine-Anjou cows after 280 days.

1978 CALF CROP

1978 BREEDING for the 1979 CALF CROP

Pg 9

Calf No.	Cow No.	Date Born	Sex	Sire	Type of breeding	Dem.	Remark	Days between services / Total elapsed time	Service Number	Date Bred	Bull No.	Num. Day of breeding
T331	T331	250 256 9-13-77	2	1883			SI SI LH. OR		1	12-15	54	15
T336	T336	285 264 9-21-77	3	54-42			SI SI LH. OR		1	12-3	E 4	3
T343	T343	283 256 9-13-77	3	1883			SI SI LH. OR		1	12-6	TAN 47	6
T347	T347	289 268 9 25-77	2	54			SI SI LH OR		1	12-27	353	27
T352	T352	279 248 9-5-77	3	E 4			SI SI LH OR		1	12-11	E 4	11

The next sheet is the form we use at breeding time. This is made in duplicate and includes: cow number, bull bred to, breeding date, expected calving date based on a 283-day gestation period, service number, elapsed time from last calving, numerical breeding day, and pasture. Normally, at the ranch, we fill in everything but elapsed time between breeding and elapsed time from last calving. This is normally done at the office.

RAMSEY RANCH

Breeding Record 1977

Page 3

For 1977 Calf Crop

Cow No.	Bull No.	Breeding Date	Expected Calving Date	Service No.	Elapsed Time Between Service	Tech. No.	Frozen Semen	Elapsed Time From Last Calving	Art. or Nat.	Numerical Day Breeding Season	Location	Remarks
C91	Tzy	11-30	9-8	1		1		82	1	3	SB	
C453	Tzy			1							SB	
C479	Tzy			1							SB	
R393	Tzy			1							HP	
R454	Tzy			1							HP	
B877	Tzy			1							HP	
T409	BN20			1							MC	
T499	1883			1							MC	
M321	MA03			1							NO	
B583	Tzy			1							SO	
C47	Tzy			1							SO	
T24	1883			1							CP	
B684	Tzy	12-1	9-9	1						4	SB	
C130	Tzy			1							SB	

After the breeding season, the information collected during the breeding season is run through a computer to come up with something we can use. The first five columns in what we call "Breeding Report Number One" are cow information: cow number, age of cow, sire of cow, her dam's number, and a later weight--which we don't use any more but has been replaced with yearling weight. The rest of this sheet deals with breeding. There is a column for every breeding this cow had during the breeding season including: sire of calf, breeding date, expected calving date, numerical day bred, service number, total elapsed time, and elapsed time between services. The cow number is repeated in the last column. We find this to be very convenient. We put this report in a binder, and it is easy to find individual cows without completely opening the binder. The "OK" on the outer edge of the sheet is the result of the pregnancy check.

The next report ("Breeding Report Number Two") lists all the cows that are going to calve each day of the calving season. This report is used for the most part in sorting cows into the various pastures before calving season starts. It is also an excellent report to study total time elapsed from last calving.

In addition to the sample reports I have shown you, we also get a report on the conception rates of all the bulls used in the program.

The last report is what we call "Report 6" and lists the total production of all the cows in the herd. I brought a couple of records of the older cows born in the fall of 1966 and dropped their eleventh calf this fall. The information on the top line is:

1. Cow Information--Breeding Value (BV) as determined by a formula used by the American Angus Association.

2. Frame Size--We have gone through our entire cow herd. By visual observation, we have put a frame score of 3 to 1 on all our cows, with 3 being the larger, more upstanding cow.

3. Dam of the cow.

4. Family is sire of the cow.

5. Crop year.

All the rest of the information on this sheet pertains to the cow's production: Birth dates, sex of calf, sire of calf, grade of calf, weight and age when weighed, adjustments on weights, 205-day adjusted weight, ratio on weight, and ratio on grade.

BREEDING REPORT NUMBER ONE

Cow Brand	Age of Dam Yr.	Sire of Dam	Dam No. of Calf	Later Wt. of Dam	Sire of Calf	Breeding Date Mo. Da. Yr.	Date of Calving Mo. Da. Yr.	Num. Day	Service No.	Total Elapsed Time	Elapsed Time between Services	Frozen Semen	Type of Breeding	Cow No.
R290	65	246	R97	590	54-142	12-06-77	9-14-78	6	1	73		1	1	R290 OK
					54-142	12-26-77	10-04-78	26	2	93	20	1	1	
R294	65	246	R119	500	54	12-08-77	9-16-78	8	1	76		1	1	R294 OK
					RE	1-02-78	10-11-78	33	2	101	25	1	1	
R329	66	246	R85	590	54-142	12-06-77	9-14-78	6	1	86		1	1	R329 OK
R333	66	246	R129	530	E4	12-07-77	9-15-78	7	1	90		1	1	R333 OK
R362	66	154	R137	560	E4	12-01-77	9-09-78	1	1	83		1	1	R362 OK
R365	66	154	R164	560	54	12-17-77	9-25-78	17	1	97		1	1	R365 OK
R377	66	154	R227	620	353	12-03-77	9-11-78	3	1	70		1	1	R377 OK
					353	12-23-77	10-01-78	23	2	90	20	1	1	

BREEDING REPORT NUMBER TWO

Expected Calving Date	Cow Number	Age of Dam Year	Sire of Calf	Breeding Date Mo. Da. Yr.	Service Number	Numerical Day	Total Elapsed Time	Time Between Services	Type of Breeding
9-20-78	R733	70	6242	12-12-77	1	12	87		1
	R790	70	6242		1		78		1
	T1	71	6242		1		86		1
	T17	71	6242		1		81		1
	T120	71	353		2		73	11	1
	T345	72	353		1		72		1
	T430	73	6242		1		94		1
	T519	73	353		1		81		1
	T596	73	6249		1		101		1
	T637	74	6242		1		99		1
	T859	74	6242		1		90		1
	X11	75	6249		1		67		1
	X170	75	54		1		76		1
	X506	77	353-65		1		---		1
	X593	77	353-65		1		---		1
	B791	67	E4		1		96		1
	C283	69	E4		1		58		1
	C510	71	E4		1		82		1
	C527	71	E4		1		71		1
	M251	74	MA29		1		91		1
	M424	75	TZO		1		70		1
	M477	75	MA29		1		64		1
	M730	77	54		1		---		1
	E25	75	TZO		2		65	9	1
	E144	77	7MA01		1		---		1
	E150	77	7MA01		1		---		1
9-21-78	R440	67	6239	12-13-77	1	13	73		1
	R520	68	54		1		95		1
	R623	69	54		1		92		1
	R829	70	54		1		94		1
	T56	71	54		1		96		1
	T175	71	6239		1		88		1
	T200	72	6239		1		62		1
	T437	73	6239		1		98		1
	T619	73	6239		1		82		1
	T780	74	6239		1		77		1

"REPORT 6"

CALF NO.	Date of Birth Mo. Da. Yr.	Crop Year	Sex of Calf	Sire of Calf	Type of Breeding	Grade	Working Wt.	Age in Days	Final Adj. Wt.	Adj. Daily Gain	Daily Gain	Demerit	Keeper	Working	Ratio FAW	Ratio Grade	Progeny	Sale Price	
									BV106		Frame 3			Dam of Cow R42			Family 704		Crop Year 67 R440
R440	10-11-68	69	3	U64	1	14	460	250	446	188	160		8	8	101	97	T208	$650	
R440	12-25-69	70	3	X78	2	14	420	181	515	222	199			L	117	95	783	$750	
R440	12-01-70	71	2	R38	1	15	520	212	583	255	217		2	N	123	100	T14		
R440	10-17-71	72	3	AN13		16	640	241	554	241	241			I	107	110	E31	$1000	
R440	9-18-72	73	3	K51		16	480	225	443	187	187			A	95	103	51-223	$319	
R440	10-07-73	74	3	54		16	600	247	509	219	219			I	98	104	Y121		
R440	9-18-74	75	2	54		17	470	230	425	178	178		2	D	107	117	X18		
R440	9-06-75	76	2	G37		16	580	249	488	209	209			E	115	109	X309		
R440	9-18-76	77	2	U519		16	460	248	391	159	159			C	95	108	X518		
R440	10-01-77	78	3	U523		15	550	234	509	217	217			E	116	105	U523-2		

									BV103		Frame 3		Dam of Cow R97				Family 704		C4op Year 67 R447
R447	9-20-68	69	2	U64	1	15	450	242	480	205	161		2	3	109	104	R676		
R447	10-31-69	70	3	R38	1	15	480	236	468	199	178			L	107	102	P84	$500	
R447	10-19-70	71	3	K51	1	15	570	245	510	220	208			L	108	102	51-67	$540	
R447	9-19-71	72	3	K51		14	550	226	505	217	217			A	101	95	51-131	$500	
R447	9-23-72	73	1	K51		15	430	226	396	164	164			C	98	197			
R447	9-04-73	74	2	54		16	500	251	419	175	175			E	105	108		$725	Cran. Futurity 12-8-74
R447	9-21-74	75	3	54		15	620	226	568	248	248			C	125	102	54-160	$446.63	
R447	9-06-75	76	3	G37		14	650	249	546	237	237			E	111	95	G37-9		
R447	9-01-76	77	3	U521		16	670	252	557	240	240			B	115	106	S447		
R447	9-17-77	78	3	U523		15	600	242	538	231	221			E	123	105	U523-3		

HOW RECORDS ARE USED FOR SELECTION AND CULLING FOR REPRODUCTION AND PRODUCTION PERFORMANCE

From studying our records, it is evident it is very hard to move a cow more than 20 or 30 days in the calving season. It is also very evident you only have about 24 hours a year to get a cow bred back so she has a calf every year. Our first cull on reproduction are those cows that settle the fartherest after a 60-day calving season. We would like to calve all our cows in a 45-day calving season; because as you all know, every day a cow loses calving after the first day costs about 2 pounds of calf at weaning time. Therefore, except for exceptional producers, a cow calving on day 60 of the calving season will wean about 100 to 120 pounds less calf; and weight at weaning time is still what makes the money to pay operating costs and profits. We would rather keep a cow that consistently calves the first three weeks of the calving season that may have a somewhat lower 205-day weight than one that calves late with a higher 205-day weight.

After culling late-calving cows and cows that have become shelly with no teeth, we next cull on production. In using "Report 6" to cull cows, any young cow after two calves that has a weaning ratio under 90 automatically leaves. If we have enough replacements, we raise the ratio accordingly. Some people say cull on the first calf, and you will be right about 90 percent of the time. We do not find this to be true. I think mainly because a 2-year-old heifer hasn't developed enough to milk up to her potential, and I think this is especially true with the exotic breeds.

We like to keep a lot more heifers than we expect to need for replacements. Our program is to synchronize these heifers and keep the ones that settle in the first part of the breeding season. By doing this, we have our heifers calve in a very short period of time so they can be watched more closely. It also gives them more time to recuperate and be ready to be bred back for a second calf.

K.G. Odde and G.H. Kiracofe of Kansas State University did a study on 1,536 fall-calving, Ramsey Ranch Angus cows on the effect of Post-Partum Breeding interval on conception rates in beef cows.

Introduction

Calving interval is an important economic consideration in a cow-calf operation. To maintain a yearly calving interval, management pressure must be placed on getting cows bred as early as possible after calving.

Beef cows have an indefinite non-cycling period after calving. In addition, fertility is low with heats expressed shortly after calving. A minimum post-partum interval is required for uterine involution and for recovery of the uterine mucosa. Many factors--including nutrition level before and after calving, calf suckling, and milk production--influence the length of time from calving to conception. We studied the specific relationship between post-partum breeding interval and conception rate in beef cows.

Experimental Procedure

Breeding and calving records for 1970-72 were provided by Ramsey Ranch, El Dorado, Kansas. Data were analyzed for 1,536 fall-calving, Angus cows that were bred artificially or by a clean-up bull. Breeding dates were verified by subsequent calving dates. Conception rate was defined as number of cows conceived/number of services.

Results and Discussion

Conception rate was highest for cows bred 100-109 days post-partum; next were those bred 90-99 days. Conception rates were lowest, and the fewest cows showed heat 10-30 days post-partum. This would be expected, as uterine involution occurs then. Conception rate was unexpectedly high, 63 percent, 40-49 days post-partum. A possible reason for this observation is that a number of the highly fertile cows may have shown their first heat and conceived during this period. The number of cows showing heat 40-49 days was not high compared with 60-100 days. The conception rate declined 110-140 days post-partum, probably because of a number of problem breeders.

These data indicate that, under good management, normal fertility can be expected when cows in heat are bred 40 or more days post-partum.

TABLE 1. EFFECT OF POST-PARTUM INTERVAL ON CONCEPTION RATE IN BEEF COWS

Days Post-Partum	Number of Services	Number Conceived	Conception Rate (%)
10-19	4	1	25.0
20-29	22	8	36.4
30-39	45	23	51.1
40-49	92	58	63.0
50-59	175	97	55.4
60-69	253	148	58.5
70-79	436	251	57.6
80-89	419	255	60.9
90-99	351	231	65.8
100-109	181	125	69.1
110-119	127	75	59.1
120-129	72	35	48.6
130-139	39	17	43.6
TOTAL	2216	1324	59.7 (avg.)

ooOoo

TEXAS EXTENSION REPRODUCTION PROGRAMS
EXTENSION-INDUSTRY PROGRAMS IN ARTIFICIAL INSEMINATION AND PREGNANCY DETERMINATION

Beginning in the early 1960's, teaching and research staff at Texas A&M University initiated a limited number of pregnancy testing and semen evaluation short courses for Texas ranchers. The response to these programs was strong and, in 1968, ultimately led the Texas Agricultural Extension Service to establish a position for a State-level Extension specialist in Reproductive Physiology.

Following the establishment of the position, programs in pregnancy testing and semen evaluation were continued and taught Statewide. The program has progressively expanded to include short courses in fertility and dystocia problems, breeding herd management, and skill training in artificial insemination (AI).

Although the entire animal reproduction program in beef reproduction has been enthusiastically received by Texas ranchers, one area has received particular attention and has had a significant affect on Extension teaching endeavors in nearly all areas of the animal sciences. We refer to the program as joint Extension-Industry AI and Pregnancy Testing Clinics. The program is unique in that it was the first time Texas A&M had joined with industry in a full-time teaching endeavor and also because it opened an entirely new audience group to Extension animal science.

The joint teaching effort between the Texas Agricultural Extension Service and commercial AI organizations resulted from the large number of requests received from producers for skill training in artificial insemination. Texas A&M maintained a small bull stud during the 1940's and early 1950's and, as a part of this function, taught on-campus short courses to producers interested in learning the skill of AI. The purpose of the stud was to assist Texas producers during the infancy of commercial AI development. As these companies developed and gained sufficient organizational strength to effectively disseminate semen, Texas A&M discontinued their stud and training program.

Artificial insemination was used only nominally in our State until ranchers became interested in exotic breeds in the late 1960's. With this came requests for skill training in AI to a highly understaffed and unprepared industry. As a result, Texas A&M began to

---

Presented by John R. Beverly, Extension Reproduction Specialist, Texas A&M Univ, College Station, TX, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

receive voluminous requests for Extension programs in AI training. We were then faced with developing a complete training program and handling the logistics of cow acquisition and sales. Since we had at that time a one-man staff in this area and no appropriations for procuring cows, much less absorbing the losses, we turned to an alternative. The alternative was to seek out those companies operating in Texas that offered training in AI and offer them our one resource-subject matter speciality.

All of the companies operating in Texas at that time were contacted and of this number, one agreed to cooperate on a joint basis. It was determined that our program in pregnancy testing was of interest to the majority of their trainees and, therefore, would be incorporated with AI training as an optional item. In addition, we would lend support to the AI training in classroom teaching of nutrition, breeding herd management, herd health, and calving problems. The addition of pregnancy testing to the program was also added since pregnant cows were an unwanted residue in the AI training programs. Heretofore, pregnant cows were identified but were unsatisfactory for use in teaching the skill of AI. By offering pregnancy testing in addition to the routine AI training, pregnant cows could be utilized and, therefore, helped defray expenses in existing AI training programs.

Two joint Extension-Industry programs were conducted in 1969 on a trial basis. There were numerous mistakes, but the results were promising enough to plan and publicize 6 clinics for the following year. Although our expectations were high, they did not nearly match the response that met us. Our teaching capacity was for about 30 students; and for the entire year, we were confronted with 2 to 3 times this number of applicants for each clinic. Since that time, we have been faced with a heavy demand; and as a result, we now have many area specialists throughout the State assisting and giving leadership to these programs. To date, we have progressively increased the number of clinics and will conduct a total of 32 during 1979.

Space does not permit a detailed outline or syllabus for the program, but most clinics are 4-4½ days in length with time being equally devoted to classroom and field work with cows on AI and/or pregnancy testing. Class time includes instruction in AI technique and procedures as well as technique of pregnancy testing. Additional class time is given to nutrition of the breeding herd, breeding herd management, fertility problems, herd health problems, and managing calving problems.

Probably one of the most critical elements to the economic stability and success of the program is cow acquisition and

handling. Training in AI requires approximately 2-2½ cows per man and pregnancy testing from 2½-3 cows per man. The effectiveness of the pregnancy testing programs is not only dependent upon cow numbers, but on an adequate distribution of cows in all stages of pregnancy. In most instances, a typical day's run of slaughter cows will give the necessary variation; although we do experience some problems with seasonal variation in numbers of pregnant cows. Cows for the clinic are sometimes purchased and resold for slaughter; however, many clinics have been operating by leasing cows from packer buyers or packers for the 4 to 5 day period. The leasing program is undoubtedly the preferred means, particularly during periods of price instability and wide price fluctuations.

At the conclusion of the clinic, participants are given a procedure examination in AI technique and upon satisfactory completion are given a school certificate and a technician card. The certification is important due to the requirement by many breed associations for cattle registration. Students in pregnancy testing are also given an examination and must demonstrate satisfactory performance. Certificates are given to recognize their participation and document their training. We have found that many students use the certificates in resumes and that the certificates have become recognized by a large segment of our ranching community as attesting to quality education in the subject. It is, of course, not intended nor used as a licensing or registration device.

We are often asked about the reception of veterinarians and veterinary groups to this program, particularly that of pregnancy testing. The current veterinarian statutes in Texas permit teaching of pregnancy testing to the individual rancher and testing by the rancher on his own cattle or that of his employer. We have endeavored to stress this to our students and to date have had no flagrant violations of this restriction. It has been our experience that good veterinary practitioners support this program and have found that as a rancher becomes familiar with his herd and its needs, he also gains a cognizance for better management and overall herd health programs. We are fortunate in Texas in having a strong veterinary group that have not only expressed an interest in their profession but also that of the rancher with whom they work.

The joint Extension-Industry sponsored programs have offered Texas A&M and our Extension specialists some unique opportunities. It has given exposure to an entirely new audience that we were not contacting in our traditional county programs. Our county level programs have not really met the demand of our larger ranchers or perhaps have not been recognized by them. Several Extension surveys revealed that Extension reproduction programs at the county level were reaching producers owning from 10 to 100 cows. Conversely,

the joint Extension-Industry sponsored programs are serving ranchers with 200 to 2,000 cattle. Data from programs over the last 2 years would indicate that the participating ranchers own an average of 200 cattle. During the 9 years that Texas A&M has been working with the joint Extension-Industry program, the ranchers who have been trained either owned or exercised management control over one-half million cattle. Although this does not constitute all of the cow numbers in Texas, it does exercise a significant influence over a large segment of our cattle population.

Exposure to the larger ranchers has also enhanced the image of Extension teaching competence in the ranching community. More important, these programs have given an avenue and means of introducing other Extension animal specialists in areas such as nutrition, animal breeding, herd health, and herd management. Because of the contact with these individuals and their association with varied livestock groups and organizations, it has provided a significant avenue for other programs. In addition, it has also been an effective means of exposing our area livestock personnel and has provided a basis for many personal as well as professional relationships. These relationships have led to more effective communications within their areas and, in some instances, to some very significant result demonstrations and trials. Such contacts have also allowed Extension personnel to identify key producers who have been able to cooperate and support a variety of research endeavors in animal science.

Certainly, we do not offer the joint Extension-Industry program as a panacea nor as a substitute for our county programs. County programs have been and continue to be our grass-roots base and our agents, the key to this group. The Extension-Industry program is simply another avenue for extending the influence of the Extension animal science programs. The basis for the program is training in the techniques of AI and pregnancy testing but equally, if not more important, is the opportunity it offers to us to teach in-depth information in a variety of subjects in Extension animal science.

ooOoo

TEXAS EXTENSION REPRODUCTION PROGRAMS
EVALUATING REPRODUCTIVE POTENTIAL OF THE BULL

Several studies with beef bulls being used in natural service situations have reported that 15 to 20 percent of bulls examined did not receive a satisfactory rating as potential breeders. Reasons for bulls not being classified as satisfactory are many and varied and beyond the scope and intent of this paper. This large percentage of bulls which are not satisfactory potential breeders deserve considerable attention by the livestock industry. Bull fertility must be maximized if we are to have a large portion of our cows pregnant early in the breeding season. Additionally, mating behavior and libido are concerns which may limit the efficiency of bulls in a natural mating situation; and these parameters must receive increased emphasis.

Recognizing that a significant portion of bulls not adequately impregnating cows contributed to low percent calf crops led to a cooperative effort between the Animal Science Extension staff and the Veterinary Science staff at Texas A&M University in developing an educational program. Beef producers needed to be informed of problems associated with bull fertility and that there was a method to eliminate poor-risk bulls. In addition, it was recognized that not all veterinary practitioners had maintained their skills or kept abreast of the new guidelines established by The Society of Theriogenology for field evaluation of potential fertility of bulls. It was hoped that producers would become aware of what constituted a Breeding Soundness Evaluation and that practitioners would be provided with a reason for a renewed interest in this area through direct exposure and feedback from their clientele. The eventual result being--eliminating of bulls with less than satisfactory breeding potential from our breeding herds.

Our approach has been a method demonstration of a complete Breeding Soundness Evaluation on a bull, with a continuous narration of what was being done and why. In a brief introduction, and throughout the demonstration, the importance of economic loss resulting from bulls with suboptional fertility is stressed.

The demonstration includes a general physical examination and a more intensive examination of the reproductive system. A life-size schematic of the bull's reproductive system has been drawn on a 4' x 8' display board to aid in describing reproductive anatomy.

Presented by John C. Spitzer, Area Extension Livestock Specialist, Texas A&M Univ, 301 N. Main Street, Bryan, TX, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

Following the physical examination, a scrotal circumference measurement is obtained and related to the bull's age. After a description of the equipment used, a semen sample is collected via electro-ejaculation. Semen is then evaluated for motility and morphology under a microscope fitted with an RCA model TC-1000 closed circuit micro-video camera. This camera is available with adaptors to allow attachment to any microscope. Utilization of this camera allows viewing of the microscope field on as many as 4 standard television sets. Many producers have not heretofore seen a sperm cell, let alone been able to view the actual semen sample while it is being evaluated.

We fully describe each step of the Breeding Soundness Evaluation, what criteria are being related to potential fertility, and the importance of the total examination. Following our demonstration, we present a brief discussion of libido and mating behavior in bulls and how they relate to the bull's success as a satisfactory breeder. Bull to female ratio and other topics of bull management are also discussed. A mimeographed handout has been prepared and is distributed. Producers are encouraged to have their veterinarian conduct a Breeding Soundness Evaluation on every bull, every year.

Reactions from Texas beef producers have been positive. Although this program has only been conducted for a little over a year, we are certain of an increase in the number of bulls which are presented for evaluation of breeding soundness. Veterinarians have also responded favorably to this program. We have recently conducted a 2-day workshop on bull fertility in cooperation with the Bovine Ranch Practice Committee of The Texas Veterinary Medical Association. Over 65 Bovine Practitioners increased their awareness of the Breeding Soundness Evaluation as now recommended by The Society for Theriogenology and developed or improved their technical skills to conduct a more competent examination. These reactions cannot help but have a positive impact on Texas beef production by reducing the number of poor-risk bulls in our breeding herds.

ooOoo

TEXAS EXTENSION REPRODUCTION PROGRAMS
PREGNANCY TESTING AND THE LARGE RANCHES

As a routine management practice, pregnancy testing is relatively new to many of the larger ranches. Its acceptance has been hindered by preconceived ideas and years of tradition. Beef cattle specialists with the Texas Agricultural Extension Service have successfully utilized pregnancy testing as an educational program area to initiate other management techniques with the large ranches.

A complex problem for all ranches is the management of replacement heifers. Pregnancy testing fits ideally into the heifer program. By pregnancy testing, open heifers are removed, thereby eliminating future breeding problems. Palpating replacement heifers increases the percentage of heifers that calve early in the season. Research has shown these heifers will continue to calve early throughout their productive lifetime.

Texas Extension programs in reproduction begin at the county level. County pregnancy testing clinics have been the initial contacts with the large ranches. In general, one or two cowboys will attend the county pregnancy testing clinics. From this initial contact, additional training is conducted on the individual ranches. Basic training in palpation is given at the county clinics. A slide presentation, precedes actual cow practice. These clinics are generally two days in length. The participants can palpate from 10 to 50 cows each.

Ranch personnel, having attended a county clinic, are now acquainted with palpation. Proficiency in the technique comes from practice. Working with previously trained students on the ranch is the key to a successful program. This is done for several reasons.

1. It helps to refresh the student on the basics learned at the county clinic.

2. By checking questionable heifers, it assures accuracy.

3. By associating with the ranch crew, other cowboys expressing interest in palpation can work under your supervision.

The primary objective at this point is to build the trainee's confidence.

Presented by Whitney Rounds, Area Extension Livestock Specialist, Texas A&M Univ, Box 2159, Vernon, TX, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

The county clinic, with followup training on the ranch, has often been Extension's only contact with the large ranches. Through a successful palpation program, other management problems can be addressed; i.e., supplemental feeding, sire selection, stocker cattle management, and grazing systems.

Several factors can dictate success or failure. Personal attitude toward the program can make or break it. Personnel forced to participate only slow progress. Experience has shown younger cowboys learn quickly with enthusiasm. An incentive program is an effective inducement. Large ranches can use an incentive program effectively in pregnancy testing and calving heifers.

As a management tool, pregnancy testing has been utilized to increase the profit potential for the large cow/calf operator. The success of Extension programs in reproduction, with the large ranches, has opened the door to other opportunities for Extension with this producer group.

ooOoo

FIRST TO LAST IS CRITICAL

The business of beef production is one of many related facets. In reality, it boils down to pounds produced. The efficiency of the operation is increased if costs are reduced per unit of production, more units are produced at the same costs, or cost per unit is increased and a corresponding increase occurs in units produced. This unit of production in beef cattle is pounds. These pounds to sell come from cull cows, cull bulls, cull replacement heifers, and calves or yearlings. The pounds produced per like unit vary from year to year due to environmental effects.

The environment is natural (range and pasture) or artificial (feeding programs). Over time, in a stable beef operation, environment averages out to the point that classes of salable cattle sell at about the same weight year in and year out.

If you assume that an operation is stable and that year to year the production per unit is about the same, how can increases in pounds come about? It could come about by: (1) Improving environment; (2) Genetic increase for size; and (3) Holding growing cattle to heavier weights or more age.

The majority of the salable pounds of beef come from the calf crop. The simplest thing to do to increase weaning weight is to increase the average age. This can be done by: (1) Weaning at a later date than normal; or (2) More calves born earlier in the season. Due to range conditions, regulations, and seasons, it is not always possible to hold calves to a later weaning date. The second alternative of more calves born earlier seems to have a lot of possibility in Idaho.

According to data from the Beef Cattle Improvement computer program, the average calving season corresponds to 5 heat periods or more. About 30 percent of the calves are born in the first 20 days, about 25 percent in the second 20 days, and 20 percent in the third 20 days. The rest are spread out over the remaining 2 or 3 heat periods. Some of the economics of a long calving season versus a short calving season is illustrated in Table 1.

Presented by J. D. Mankin, Extension Animal Scientist, Route 8, Box 8478, Research & Extension Center, Caldwell, ID, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

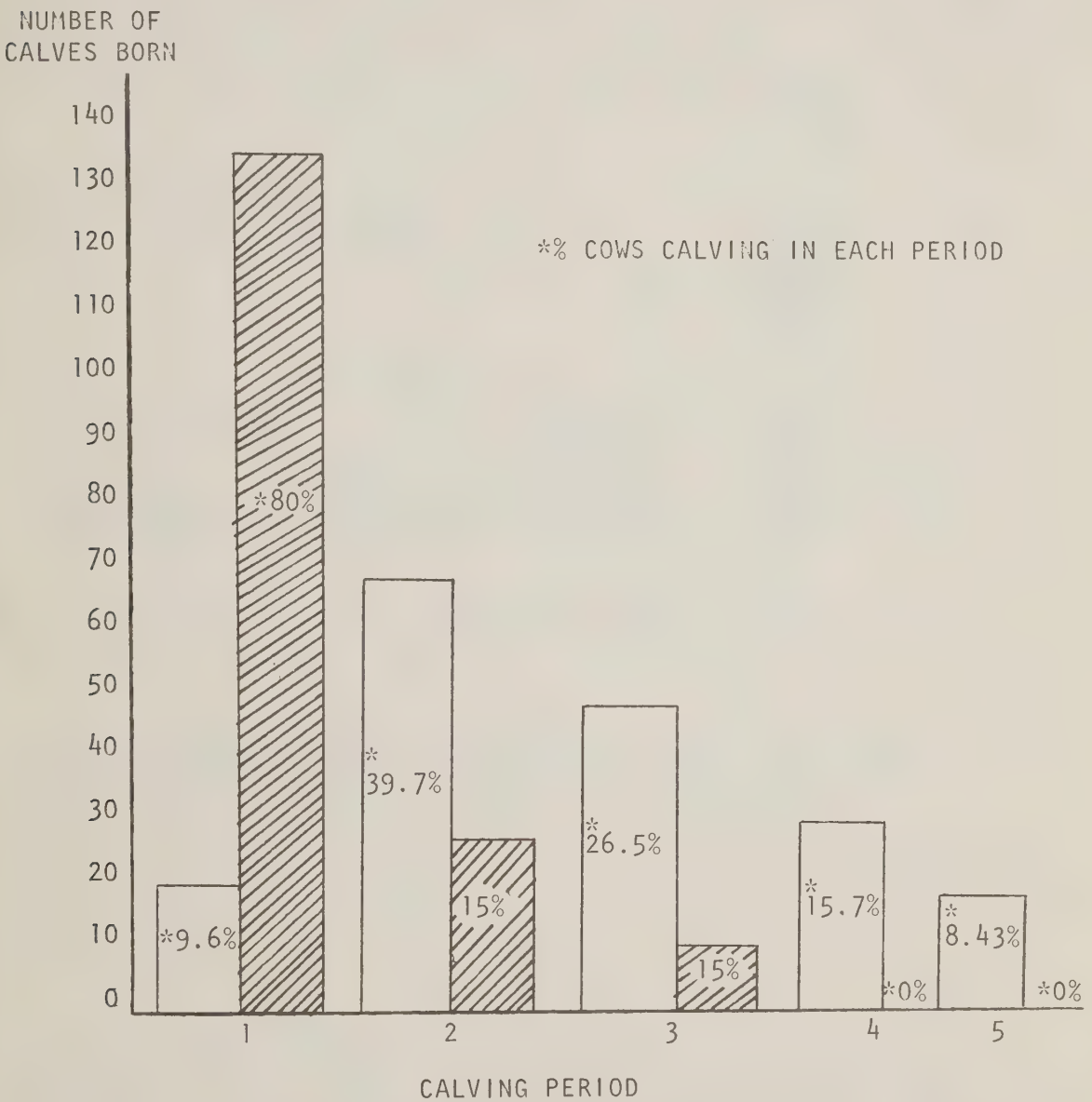
TABLE 1.

Present Production					Future Production If Pgm to Shorten Calving Season Were Adopted		
Calving Periods	% Cows Calving	Avg. W/W	Lbs. Prod./ 100 Cows	Lbs. Lost/Day of Age	% Cows Calving	Avg. W/W	Lbs. Prod./ 100 Cows
1	23	516	11,868		80	516	41,280
2	31	492	15,252	1.2	20	492	9,840
3	21	459	9,639	1.6			
4	12	432	5,184	1.3			
5	7	392	2,744	2.0			
6	6	346	2,076	2.3			
TOTAL			46,763	1.7 (Avg.)			51,120

This table shows that if 80 percent of the cows calved in the first 20 days and 20 percent in the second, then 4,357 pounds more calf would be produced by each 100 cows or 44 pounds per cow. At an average weaning weight of 440 pounds, this represents 10 calves or 10 percent increase on 100 cows. A substantial amount of money could be invested in management in order to accomplish a short calving season.

We are building some unique things in the Idaho Beef Cattle Improvement (BCI) program. There is no other BCI program available that will give you a summary of as much management opportunity information. A very important piece of management information that is generated with the Idaho BCI program is a summary of the calving season in 20-day segments. This summary is a graphic record of the past breeding season. One of the most sensitive barometers to management is the reproductive cycle of the cow herd (Chart 1). This is best expressed in the length of the calving season. When the calving season is stretched out over more than 45 to 50 days, production is lost. These losses can occur in actual cow weight, salvage cow weight, extra feed for the late calvers, genetic improvement through less selection pressure, and more labor. Also, if late calvers are segregated for proper feeding, extra facilities will be required. Under good management systems, 80 percent of the cows should calve within the first 20 days, 95 percent of the cows should calve within 45 days, and 100 percent of the cows should calve within no more than 60 days.

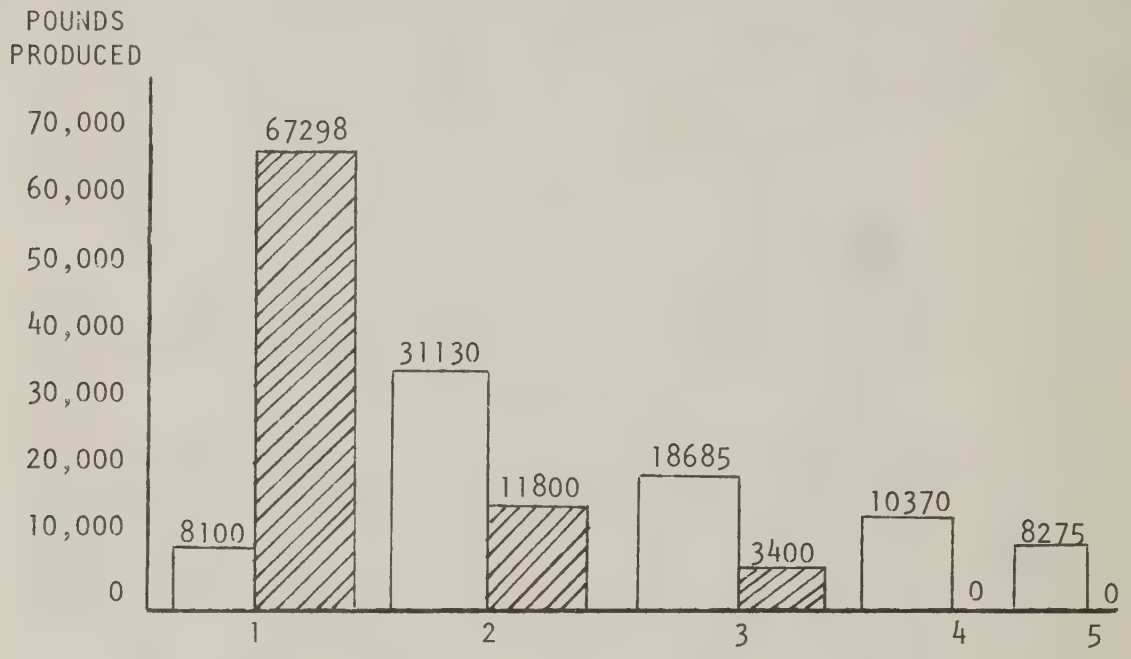
CHART 1. The clear bar shows the number of calves born in the first 20 days of the calving season. The shaded bar indicates what could be achieved with 80 percent of the cows calving in the first 20 days of the calving season. Instead of having 16 calves born in the first calving period, there would have been 133 calves born.



(Illustration taken from a printout of a 166-head herd on the Commercial Idaho BCI Program.)

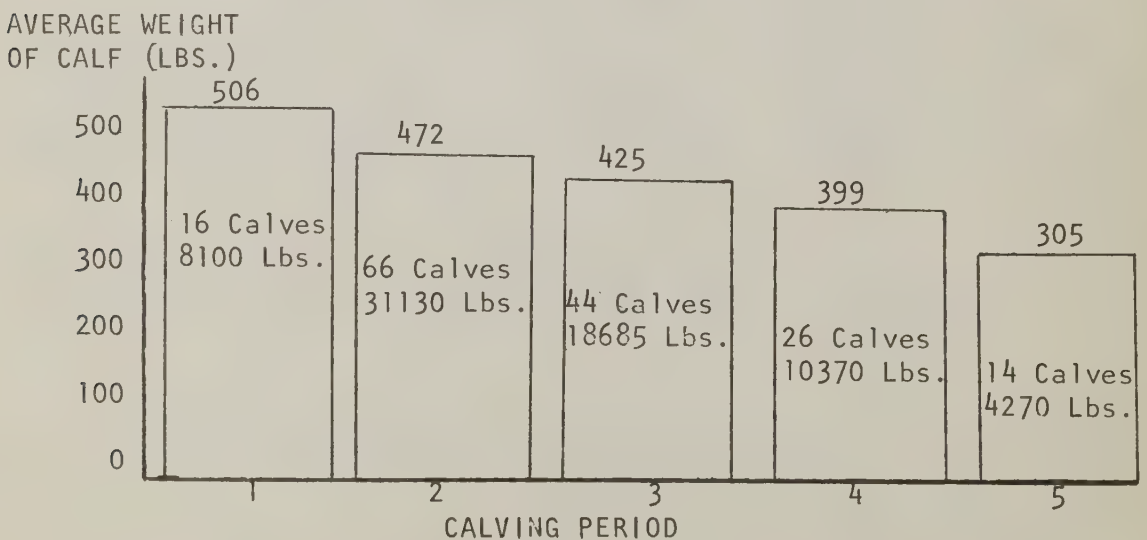
This vividly points out the economic importance of making every effort to have the maximum number of cows calve early in the calving season (Charts 2 and 3).

CHART 2. This chart shows the actual pounds produced (clear bar) at each calving period in contrast to what would have been produced (shaded bar) had 80 percent of the cows calved in the first calving period, 15 percent in the second period, and 5 percent in the third. If you value this extra production at 40¢/pound, that would be $4,325.



(Illustration taken from a printout of a 166-head herd on the Commercial Idaho BCI Program.)

CHART 3. This chart shows the average actual weight of the calves born during each calving period. It is obvious that the older calves are heavier. Also included in each group are the total pounds of calf produced by each calving period.



(Illustration taken from a printout of a 166-head herd on the Commercial Idaho BCI Program.)

There is no doubt that if records can point out opportunities to increase production in a cow herd by 7 percent, they are worth considerable time to collect. Collecting records would be of no value if they were not used to make management decisions.

We might ask the question, "Why do the cows get spread out in the calving season?" Well, the Idaho BCI program computer printout gives a summary of the calving season by age of cow and calving period. The printout in Table 2 illustrates that the problem often starts with the breeding of the yearling heifers. This is reflected in the calving pattern of the 2-year-old heifers.

TABLE 2. AVERAGES BY CALVING PERIOD

PERIOD	COUNT	AGE OF DAM					WEAN WT	ADJUSTED 205-DAY WEIGHT	AVERAGE DAILY GAIN
		2 YR	3 YR	4 YR	5-10 YR	11+ YR			
1	14	2	2	5	5	0	416.9	389.6	1.49
2	163	10	6	18	122	7	374.3	380.8	1.49
3	259	24	26	18	178	13	364.8	395.3	1.54
4	69	14	10	11	33	1	312.8	378.4	1.42
5	26	2	2	3	18	1	323.5	410.6	1.62
6	18	0	2	2	14	0	296.1	404.9	1.59
8	1	0	0	0	1	0	175.0	304.0	1.14

If, as is shown in Table 2, the heifers take 4 or 5 20-day segments to become pregnant, they will be strung out in their calving the rest of their lives. This is reflective of management.

Why didn't the heifers breed in 40 days? There could be several reasons. The first to check out would be disease. There are a number of disease problems that could be involved, such as vaginitis or vibrio.

The second reason yearling heifers fail to breed is, they are just not mature enough. A heifer should calve by the time she is 24 months old. If 9 months of pregnancy is allowed, the heifer must be settled at 15 months. Now, if you back off from that 40 days, the heifers must then be cycling regularly at 13½ months. On most commercial operations, this means you cannot be negligent in developing these heifers.

A third reason for heifers to be slow in breeding is often because only one bull is put in with the replacement heifers. His fertility could be a problem.

Why are the cows themselves spread out over 5 or 6 heat periods? The primary reason is, they had problems as yearlings or 2-year-olds. In most cow herds across the country, the primary cause of failure of cows to cycle is a lack of energy. This is contrary to popular belief that protein is a big problem after calving. It is important, but not as critical to cycling as energy.

After energy deficiencies, the next most important nutrient that would be deficient in the cow herd would be phosphorus. In addition to the need for phosphorus in milk production, growth, and other factors, it plays a key role in energy metabolism. It is not unusual, if a cow herd is short on energy, to be short on phosphorus. With both deficiencies, the problem of the cow being able to metabolize enough energy to cycle is compounded.

Often times, one of the most neglected areas of herd management is in the bulls. Bulls are important to having a high number of calves born early in the calving season. They must be high in fertility; there must be an adequate number of bulls; and bulls must be distributed throughout the cycling period. In a nutshell, if you have high fertility bulls and your cows are cycling regularly, you'll get a good calf crop. Without some recordkeeping, it is impossible to get a good picture of this most important aspect--the calving season of a herd of cows. Perhaps the greatest opportunity for a producer to increase economic return is to shorten the calving season. Following is a county program we have designed to help producers to accomplish this objective.

A COUNTY EXTENSION PROGRAM GUIDE--"SHORTEN CALVING SEASON"

1. Establish a Bench Mark. The first thing that needs to be done is to establish a bench mark. The bench mark will give a base from which change can be measured. To do this, 4 or 5 herds (about 20 percent of herds) per county should be surveyed to determine an estimate of the length of the calving season for a particular county. These herds should be representative from the standpoint of size, management system (range, pasture, etc.), and level of management. This can be done by visiting each rancher personally and explaining why the information is needed.

   What information is needed?? At this point, all that is needed is the time the first calf is born until the last calf is born. This would give a figure that would fit our program planning,

such as 10 herds of cattle representing 20 percent of the herds in Bigg County were surveyed for length of calving season. The survey showed that the average for these herds was 120 days. This gives a concrete figure for planning programs around.

2. Build An Awareness of the Economic Value of a Short Calving Season--Who Should Be the Target of This Awareness Program?

   a. The ranching population, of course, would be the primary target.

   b. The local veterinarian should be brought into the picture; he will probably play a significant role in the total program.

   c. The feed mill or feed salesman. At first thought, you might think they are going to capitalize on the program. Let's fact it--they probably will. They are going to sell feed and supplements. If we could get the right kind of story and backgrounding to them, they might have as much impact as anyone else.

   d. Loan agent. These people could have a significant influence if they would and are aware of the economic advantage of a short calving season.

   I think a meeting on an area basis with each of these groups would be advisable. I don't think it would be well to mix the group. At this point, I would not try to give them all of the solutions, but would try to be sure they had a hand-out to strengthen their awareness. Perhaps here, we need something like a CIS (Current Information Series) fact sheet. I don't know if a CIS fact sheet as such would be justified.

   The veterinarians would be the most difficult to get together. Maybe they could be visited on a personal basis, or maybe you would want to contact all the support people on a personal basis. Each agent could do his own thing in this regard. From here on, the program kind of dove tails together.

3. Causes of Long Calving Season. When we look at the causes of a long calving season, there are a number of things that stand out. Most counties have been doing educational work on these items for many years, and I am sure have made an impact on the industry in the county. The problem we can no longer ignore is the measuring of the impact. The first program to get involved with the rancher and his herd would be to "Determine Length of Calving Season." The following is the simplest to the most complex program in which to get the rancher involved:

a. Mark the calendar when the first calf is born and again when the last calf is born. Count the number of days in between. That would be days of calving season. If it is longer than 45 days, there are likely opportunities to shorten the season.

b. Same as above except mark the calendar with the number of calves born each day. Make a graph by days and number of calves each day. This gives a graphic picture of the calving season.

c. Same as above except block the graph in 20-day periods.

d. Same as above except record on calendar calves each day, by age of cow (2-year-old, 3-year-old, 4-year-old, and above). Then make the graph by age of cow.

e. BCI program.

Table 3 gives a guide to the items that affect the calving season length; why they affect it; and some program areas that could be developed to shorten the season.

The first thing that must be considered is reproductive health of cows. All other efforts fail if this is not in first rate condition. The next would be nutrition of cows; really it all dove tails together as I said before.

TABLE 3. ITEMS THAT HAVE AN EFFECT ON LENGTH OF CALVING SEASON AND PROGRAM OPPORTUNITIES

ITEM	EFFECT	WHY	PROGRAM
1. Last Year's Calving Season Length	If last year's calving season was 120 days, current season will be similar.	Cows bred late aren't ready to cycle early in current breeding season.	1. Reduce length of season by pre-determined days by removal of bulls. 2. Preg test & cull potentially late calvers.
2. Reproductive Health	Diseases such as brucellosis, vibriosis, lepto, & other diseases.	Females either abort early & start cycling again; or fail to settle due to reproductive disease problems.	1. Vet check for herd health. 2. Rigid vaccination program. 3. Purchase only virgin bulls. 4. Bulls of high fertility. 5. Proper bull management.
3. Nutrition of Cows	Thin cows that aren't coming in heat within 30-50 days after calving.	When cow's needs aren't met nutritionally, they fail to cycle at all, or to cycle regularly.	1. Analyze feed. 2. Design ration to cow requirements. 3. Adequate supplements. 4. Total feed (adequate).
4. Age & Size of Replacements	Heifers fail to breed early in season.	Not old enough or not large enough to be sexually mature.	1. Select only older & larger heifers. 2. Develop replacements to meet needs of breeding season. 3. Expose more heifers than needed & keep only early breeders.
5. 2- to 3-Year Old Cows	Young cows fail to breed in desired time.	Primary cause is inadequate nutritional level for growth & milk production.	1. Feed separately from cows. 2. Early wean calves. 3. See Item 2.
6. Bulls	Bulls not settling cows.	Infertile bulls; not enough bulls for environment; bulls not in condition; crippled bulls.	1. Fertility check bulls. 2. Examine physically. 3. Proper condition. 4. Bull management.

As a sub-area to the programs in Table 3 that directly affects the length of the calving season, beef cattle programs could be developed on:

1. Baby Calf Death Loss

    a. Diseases--Scours, Pneumonia, Shipping Fever, etc.
    b. Calving Problems
    c. Accidents

2. Early Weaning of Calves

    a. Facilities
    b. Nutrition

3. Marketing

    a. Uniform Calf Crop
    b. Early Calves

4. Wintering Calves to Yearlings

5. Summer Pasture of Calves

6. Herd Improvement

7. Other Vaccination and Health Programs

8. Other Programs

CIS fact sheets, publications, and hand-outs to support a "County Program to Shorten Calving Season:"

1. Bull Management

    a. Bull Fertility
    b. Structural Problems
    c. Breeding Problems (Physical)
    d. Rotation
    e. Age and Use

2. Values of Preg Testing

    a. Are They Open?
    b. Are They Early?

3. Reproductive System, Heat Cycles, Conception

    a. Anatomy and Physiology
    b. Heat Detection

4. Vaccination Program and Herd Health

    a. How to Recognize Problems?
    b. What to Do About Them?
    c. How to Avoid Them?

5. Selection and Development of Replacements

    a. Reproductive and Maturity

        (1) Age
        (2) Size
        (3) (Breeds)

    b. Nutrient Requirements
    c. Feeds and Rations
    d. Breeding

6. Management of Young Cows

    a. Feeding--Pre-Calving
    b. Calving
    c. Feeding--Post-Calving
    d. Early Weaning

7. Cow Herd Nutrition

    a. Range
    b. Pasture
    c. Minerals
    d. Winter
    e. Aftermath
    f. Spring

8. How To Buy Bulls

    a. Age

9. Feed Analysis

    a. Why?
    b. How?
    c. When?
    d. Where?

Another program we have in Idaho that has reproductive management components is a result demonstration and applied research program known as the Pegram Project. The primary objective of this project is to minimize death loss in young calves. However, it's a total management approach to increase pounds of calf marketed per cow exposed to the bull. It also encompasses several concepts; such as the use of para-professionals as technicians, and joint financing by the beef industry in conducting result demonstrations and applied research on private ranches.

PEGRAM PROJECT

The project was initiated in 1976. Three herds with an average of 500 mature cows per ranch were selected to participate in the project based on previous records of high death loss (17 percent) in neonatal calves. Exact cause of death in these calves had not been determined; but typical clinical symptoms of diarrhea, fever, and dehydration were observed in most calves which died.

Physical Evaluation of Cow Herds

When the project was initiated, veterinarians from the Caldwell Veterinary Referral Clinic physically evaluated each cow in the herds. The physical evaluation included:

1. Age determination.
2. Cancer eye evaluation.
3. Pregnancy diagnosis.
4. Udder condition.
5. Soundness of feet and legs.

Two major problems were observed:

1. A high incidence of open cows.
2. A high incidence of cancer eye.

Ranchers culled cows from the herds based on this physical evaluation. The cows culled were primarily older cows or open cows.

BCI Records

At the beginning of the Pegram Project, all mature cows were individually identified with a numbered tag. Each calf born is now identified with a numbered tag, and complete cow-calf records are maintained on the Idaho BCI program. Four factors have been discovered through the BCI records:

1. Length of calving season on some ranches extends well over 145 days.

2. High incidence of open cows.

3. Small light-weight heifers were being returned to the cow herd.

4. Light calf weaning weights.

Delayed calving or calves not born contributes to reducing pounds of calf marketed per cow exposed to the bull. The BCI records provide the basis for emphasis in the growing and development of replacement heifers and for the reduction of open cows through improved management.

Calving Management Practices

A para-professional technician is employed to assist in calving and herd management, collecting field data, and maintaining BCI records on the 3 cow herds. In this role, he also teaches the basic principles of herd management. As a result, the cowboys working on the ranches have improved or acquired new skills associated with calving and cattle management.

Primary emphasis of the technician has been on management practices during calving. The following calving management practices have been introduced and adopted by ranchers involved in the Pegram Project:

1. Sanitation. Technicians are instructed to employ maximum sanitation possible under field conditions. As a result of this effort, ranchers have become extremely conscientious about sanitation and cleaning of equipment.

2. Calving Equipment and Supplies. Technicians have assembled equipment essential to calving management which is practical in a ranch operation. Ranchers have been trained to maintain and properly use this equipment and are requiring duplicate equipment.

3. Early Calf Treatment Based on Temperature Variation. During the course of the Project, the technician has routinely recorded temperature in sick calves with subsequent medication recommendations based on temperature. As a result of this management practice, ranchers have responded to earlier treatment of calves which show clinical symptoms of sickness.

4. Epidural Anesthetic for Difficult Birth. Technicians have demonstrated techniques for epidural anesthetics in difficult parturition. Ranchers have learned to properly administer epidurals. In addition, the proper use of calf pullers and delivery has been demonstrated and utilized throughout the project. A new type of fetal extractor will be introduced in the 1979 calving season.

5. Vetaspirator. Vetaspirators have been employed to stimulate breathing in calves which have experienced difficult parturition. As a result, each rancher has purchased a vetaspirator for use in their operation.

6. Nutritional and Electrolytic Therapy. Calf booster has been routinely administered with a bovine esophageal probe to sick calves to enhance their nutritional status and maintain electrolytic balance. This treatment has proven successful in reducing calf losses. Calf booster apparently has a soothing effect in the gut and reduces rapid dehydration. Blood chemistry is performed to indicate electrolyte balance of calves under treatment.

7. Calving Facilities. The University of Idaho designed a calving shed which was constructed by one rancher to reduce labor and improve his calving facilities.

Diagnostic service has been provided by the Veterinary Diagnostic Laboratory at Utah State University. All death losses occurring in various age cattle have been confirmed by necropsy and laboratory diagnosis. The following diseases have been identified:

1. Clostridium
2. IBR
3. BVD
4. Pasteurella
5. Chlamydial Infection
6. Thromboembolic Meningoencephalitis (TEM)

As a result of these diseases and diseases normally associated on these ranches, a beef herd health program has been designed specifically for the Pegram Project ranchers. The herd health program includes a complete breakdown of all recommended vaccine combinations. Their estimated price is also suggested along with what should be administered at various seasons according to the age of the cattle. In addition to the herd health program, forms have been developed for maintaining records regarding drugs and vaccine supplies, immunization records, and treatment records. The herd health plan has been adopted by ranchers in the Pegram Project.

It has expanded disease prevention with added immunization for existing disease organisms.

Forage Analysis

Winter forages have been sampled in two successive seasons and submitted for chemical laboratory analysis. The two nutrients most lacking have been energy and protein. However, phosphorus is marginal in most laboratory analyses of the forages. It is also suspected that some microminerals may be deficient, but a complete micronutrient analysis for these minerals has not been determined.

Cow Supplementation

After analyzing forages fed on all the ranches, appropriate supplements were formulated for one herd for the last part of the winter of 1977-78. Effects of this supplemental feeding program will be reflected in calf weaning weights for the 1978 calf crop as well as conception rate of the cows. The latter will be measured at pregnancy check time in the fall of 1978 and in the calf crop next spring.

Bovine Virus Diarrhea (BVD)

BVD is suspected to be widespread in the three cow herds. It is also suspected to be associated with unthriftiness of neonatal calves which are highly susceptible to disease and sudden death. Since the beginning of vaccination for BVD in one herd, neonatal calf death loss has been dramatically reduced.

Spaying Heifers

As a result of demonstration and training, 12 young ranch boys have learned to spay heifers. This practice has been adopted by two ranches.

Heifer Synchronization

The BCI printout for all three herds indicates that the calving period is too long, resulting in too many light calves at weaning plus extended weather related problems. One rancher expressed a desire to get his heifers bred earlier and in a shorter period. Therefore, synchronization treatments were imposed on his heifers during the early summer of 1978 in an attempt to (1) get all heifers bred during a short period of time, and (2) get small non-cycling heifers to start cycling. Results of this study will be determined at pregnancy check in the fall and at calving time next spring.

Educational Materials Prepared

1. Current Information Series (CIS) publication entitled "Beef Herd Health Program."

2. Calving Barn Design.

3. Video Tape on Calving Management.

Tentative Plans for 1978-1979

A visit with the ranchers shortly after the 1978 calving season revealed the following:

1. Calf death losses due to disease had been reduced to less than one percent.

2. The rancher who built the new calving barn has found it to be quite satisfactory in making the handling of cows and calves much easier.

3. It doesn't appear feasible to attempt a comparison of calving grounds due to cost and lack of water in desirable areas.

4. Ranchers are not interested in further synchronization work because of the number of times heifers must be worked and the delay in getting them to the range.

5. Ranchers are interested in continuing calf treatment and cow supplementation parts of the study.

6. There is a need to develop a program for growing and developing replacement heifers to ensure adequate size for breeding.

7. Two ranchers indicated they have had unusually high calf losses after weaning.

8. All ranchers have experienced some death loss of cows and calves after turning out on green range.

Based upon the above observations, plans for 1979 tentatively include:

1. Continuation of:

   a. Calf treatment comparisons.
   b. Cow supplementation comparisons.
   c. Forage sampling and analysis.

2. Comparison of different management systems for growing and developing replacement heifers. This may include early weaning and/or supplemental feeding during the summer and ration comparisons during the winter.

3. A preconditioning and/or early weaning study with calves in at least two herds to reduce the effects of stresses of weaning, shipment, and starting on feed in feedlot.

4. Supplementing cows and calves at turn-out time in the spring to prevent losses to grass tetany.

5. Electrothermal treatment for cancer eye neoplasia is being planned in the fall of 1978 during the physical evaluation and pregnancy examination of the cow herds.

Final decision regarding treatment to be used will be made in conjunction with the ranchers later in the fall of 1978.

BEEF COUNCIL GRANT FUND EXPENDITURE (FY 78)

TECHNICIAN SALARY AND FRINGE BENEFITS (8 Mos.):		$ 6,809
TRAVEL:		5,746
Local	$1,557	
Out-of-State	751	
Other In-State	3,438	
OPERATING EXPENSES:		4,293
Supplies	$1,746	
Feed Analysis	1,302	
Telephone	458	
Computer	620	
Necropsies	167	
CAPITAL OUTLAY:		636
COOPERATOR REIMBURSEMENT:		4,500
Barn Construction	$1,500	
Supplement	1.500	
Calving Site Development	1,500	
TOTAL EXPENDITURE:		$21,984
JULY BALANCE CARRIED FORWARD:		$ 6,833

It is the feeling of the Pegram Project leaders that this program has been quite successful and worthwhile. The major objective of minimizing the loss of young calves has been accomplished. The herds in the project have significantly improved pounds of calf per cow exposed to the bull, and numerous other ranchers have observed this demonstrational program and are adopting many of the improved management practices. Also, the program has proven that the ranchers in this project could have economically justified cooperatively employing a full-time technician to assist them in managing their cow herds.

ooOoo

HIGHLIGHTS OF THE STATE EXTENSION PROGRAM IN REPRODUCTION IN KENTUCKY AND OTHER STATES

When Dixon Hubbard called and asked me to talk to this group about our Extension reproduction program in Kentucky, I was a little apprehensive but agreed to do it. However, after giving it more thought, I became even more apprehensive. Our reproductive program in Kentucky is in its infancy. I think we may be at the point John Beverly was some 10 years ago in Texas as we attempt to get some things going.

With this in mind, I suggested to Dixon that I contact other States that he and I knew were making concerted efforts in the reproduction area and summarize what is being done there as well as in Kentucky. I am indebted to those individuals who responded to my letter.

I am also indebted to Bill Durfey for sharing with me his file of responses to a mail survey he did of State Extension programs as related to beef cattle reproduction. A summary of that survey was presented to the National Extension-Industry Beef Resource Committee.

First of all, I think that from the responses I've obtained and from looking over the responses to Mr. Durfey's survey, the first thing that is apparent is, every State places a high priority on reproduction in their Extension programs. Relatively few States have someone designated as a State specialist in physiology or reproduction. To my knowledge, Texas, Indiana, California, Illinois, and North Carolina fit this category. Other States, Kentucky included, have a State beef cattle or livestock specialist designated to give leadership in reproduction.

There are several specific areas which fall under the general reproduction category I want to discuss briefly as to our efforts in Kentucky and also highlight efforts in some other States. These comments will not be inclusive of efforts in all States, but I hope will serve to point out some unique approaches and perhaps serve as stimulant for the workshops which follow.

We use several means of contacting our producers. We present programs at many county producer meetings each winter. We have 120 counties in Kentucky. Although we are not requested by all counties, the number of requests we receive is becoming more than

---

Presented by Ron Parker, Extension Beef Specialist, Univ of Kentucky, Lexington, KY, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

travel budgets and time will allow. This winter we are emphasizing multi-county beef producer schools. These schools run for 5 or 6 weeks, meeting one night weekly. The biggest problem with these schools is in getting the producer to travel the required distance to attend multi-county meetings.

Every county Extension office in Kentucky has a Caramate slide projector. These are portable units which accept slide trays and project an image on a 9" x 9" screen. They are equipped with tape cassette players capable of changing slides on cue. We have used these in special instances where a specialist was unable to be at county meetings. We also have prepared slide sets accompanying tapes on particular subjects. These are available to county agents.

Another tool we have used is the tele-lecture. A slide set is provided in advance. Audio is provided by attaching a small telephone pick-up to the phone receiver. This in turn plugs into the jack of any speaker system. The only cost then is the cost of the phone call. These tele-lectures have been successful if (1) many slides are used and changed frequently, and (2) presentations are held to a maximum of 20-25 minutes.

The first area I want to discuss is planned breeding and calving seasons. Estimates are that at least 70 percent of Kentucky cattlemen run their bulls with the cow herd year-round. As a result, calving seasons are strung out with some cows essentially calving in every month of the year. As far as total cow herd management is concerned, I don't know of any one thing which is so detrimental to overall good management. Such programs as A.I., estrous synchronization, pregnancy testing, breeding soundness evaluation of bulls, and proper nutrition programs can hardly exist without defined calving seasons.

This is an area where I've placed a great deal of emphasis. I seldom talk or write about cow herd management that I don't spend some time talking about the importance of a calving season and discuss how one might be obtained on farms where they are non-existent. People are slow to change, but I think we have had an impact. At least if we visit a farm with strung-out calves, this is the first thing the producer apologizes for.

We have available the fact sheet on "A Controlled, Seasonal Cattle Breeding Program" prepared by Clyde Triplet (Georgia Extension Service) for the Southern Regional Beef Cow-Calf Handbook. This is one slide set that we probably need to develop and make available. I'm sure other States emphasize the importance of calving seasons, but it was not mentioned in any of the correspondence I had with other specialists. Also, it may not be of the same magnitude of importance in other States.

Dr. Curtis Absher (Kentucky Extension Service) initiated "The 6-90 Cowman's Club" some years ago. In order to qualify, a cattleman had to have 90 percent of his calves born within a 6-week period. Few qualified, but many became aware of the program and its emphasis. We have not emphasized this lately, but have plans to rejuvenate the idea.

Another area I want to mention here is the importance of cattle handling facilities. This is another area in which the average cattleman in Kentucky is lacking. I suspect the lack of facilities on many farms is next to calving seasons in importance as far as affecting overall cattle management. Certainly, it is important as far as many aspects of reproduction are concerned. Artificial insemination, estrous synchronization, breeding soundness evaluation, pregnancy testing, and calving management all require some degree of handling facilities. We have a Caramate slide set on this subject in the process of development.

We have recognized existing workable corral systems in a photo-feature article in the Kentucky Cattleman, a publication produced under the direction of the Kentucky Beef Cattle Association and the Livestock Breeder Journal in cooperation with our staff.

In the area of artificial insemination our emphasis has not been great. I know some people in the A.I. industry feel the Extension Service has not given A.I. the attention it deserves. However, over the last several years with cattle prices at their low point and since the "exotic" boom has partially subsided, the interest in A.I. has also subsided. In Kentucky, we have somewhere around 90,000 beef cattle farms. Many of these are extremely small farms, with estimates indicating that about half of the operators have full-time employment off the farm. In addition, cattle rank as the second or third enterprise on many farms behind grain crops and tobacco. Thus, A.I. does not fit in the management picture for many cow-calf enterprises, due to the labor requirement of detecting and inseminating cows.

Our fact sheet on beef A.I. is presently being completely revised. We have had some involvement with some industry groups in conducting A.I. schools. One of our future involvements will consist of conducting A.I. re-training seminars for technicians. We would like to increase our involvement with industry in conducting A.I. schools, but our desires are to work with A.I. groups and not to compete with them. If and when estrous synchronization products are cleared for marketing, then I see renewed interest in A.I. and the need for renewed efforts in the A.I. education area.

We have taken a very limited and cautious approach towards an educational program concerning estrous synchronization. We are

certainly aware that once clearance is obtained for one or more products, a tremendous challenge awaits all of us in educating the public to the use of such products. I am sure disasters will occur. As I see it, our job will be to reduce the numbers of these disasters. Should synchronization products become available on an unlimited basis, many well-meaning cattlemen are going to jump at the chance to incorporate their use into their programs. Without the control animals that have been a part of research field trials, the product will get the blame for poor results which are likely attributable to poor nutrition, bad semen, fatigued inseminators, and the many other factors which can contribute to poor conception rates. Responses from specialists in other States indicate the same concern. A tremendous challenge awaits us when that day comes.

Through our Extension Veterinarian, we held an educational seminar for veterinarians. To date, we have made little effort to educate producers or county agricultural agents in this area. This will come with clearance of the products. We have cooperated with A.I. and pharmaceutical companies in identifying herds for estrous synchronization field trials and in assisting with those trials.

I anticipate a renewed interest in the whole beef cattle reproduction picture and an opportunity for renewed educational efforts in reproduction when estrous synchronization becomes a reality.

Another area we have attacked with limited success is breeding soundness evaluation of bulls. Several States with central bull testing facilities have indicated that all bulls are examined for breeding soundness in the interval between the end of the test and the sale. Bulls that fail to pass the test are excluded from the sale. Indiana and Virginia in particular have taken this approach, and I am certain there are others. One aspect of this program I think is extremely important is the persons making these examinations have agreed that, upon the owner's request, they would travel to his farm at a later date and re-examine any bull which flunked his test. These programs serve as an excellent educational tool, especially for the purebred breeders consigning bulls to these central tests. Inclusion of this information in sale catalogs should also serve to increase awareness of the importance of bull examinations to the commercial cattlemen.

We have this opportunity in Kentucky. Unfortunately, to date we have not been able to capitalize on it. We co-sponsor a central bull test in cooperation with the Kentucky Beef Cattle Association. In general, we have been unsuccessful in convincing consignors there is a need for breeding soundness evaluation of these bulls. Complaints from buyers have been few, and there is always the concern of injuring a bull when using an electro-ejaculator.

Wayne Singleton (Purdue Univ, Extension Service) indicated some success in Indiana involving a cooperative effort between Extension specialists and local cattlemen's associations. Their approach has been to allow producers to bring their own bulls into a central location where the specialists were set up to conduct breeding soundness evaluations. Bulls are brought in according to a pre-arranged schedule with up to 30 bulls being examined per day.

Several specialists have indicated the need for training of practicing veterinarians in their States in this area. Many veterinarians are not equipped and do not have an appreciation for a complete breeding soundness evaluation as compared to a quick look at a semen sample under a microscope.

A survey taken in 1973 indicates less than 5 percent of Kentucky cattlemen use pregnancy testing in their herds. However, we in the Extension Service have done little to promote its use other than to give it lip service. Training the cattleman to do his own testing may have less application in Kentucky than States farther West due to the size of herds and number of part-time farmers. Owners of small herds simply can't test enough cows to become and remain proficient. Also, I think part of the reason for not offering this service in some States is the feeling of some veterinarians that the Extension specialist is entering an area which he (the veterinarian) considers sacred. However, I think two things are important in this consideration.

1. The number of cattlemen using pregnancy testing is extremely small and, therefore, can only be a small source of income to the veterinarian. Any increase in the use of pregnancy testing should be a step in favor of better cattle management.

2. I think the cattleman who attempts to do his own pregnancy testing will soon find he cannot remain proficient but, having learned of its value, will then turn to the veterinarian for this service. Thus, the long term effect of training cattlemen in pregnancy testing will be an increased demand for pregnancy testing by the veterinarian.

In other States, the only major effort I am aware of, other than in Texas, is in Oklahoma. Dusty Rich (Oklahoma Extension Service) indicates they have conducted pregnancy testing schools in counties in cooperation with local county agents. These schools are held at some central location, such as a sale barn or fair building. Each student provides 5 cows, and all students train on all cows. Cost to the student is just enough to cover cost of supplies. Dusty reports 7 to 10 of these schools are held each year, and the program has been very successful.

These were the main areas I wanted to touch upon. I know there are other areas such as calving management, replacement heifer development, and nutrition programs affecting reproduction that all States emphasize in some way.

During the rest of my time, I want to briefly discuss a program we have in Kentucky. It does not totally deal with reproduction; but since it does deal with the cow-calf enterprise, it offers an opportunity to involve many aspects of reproduction. I'm referring to a project we refer to as our "Comprehensive Cow-Calf Demonstrations."

Many practices which we recommend have been tested thoroughly under research conditions; but information on their use on the farm, integrated with the total beef production program, is often not abundant. Other recommended practices are not necessarily the result of research but, yet, are a part of sound herd management. An example is converting to and maintaining a definite calving season. Although it is a practice we recommend and put much emphasis on, we did not have documented information to use as examples in education programs.

These demonstrations were designated to fill this void as well as demonstrate the use of many recommended programs on a single farm. Our objective was to locate a few herds which were using a minimum of recommended practices. These "demonstrational" herds would then receive guidance from Extension specialists in appropriate disciplines in efforts to systematically incorporate recommended practices into the herd management scheme.

Primary inputs are made by the Extension specialists in beef cattle, forages, and veterinary science. We try to work closely with the practicing veterinarian(s) in the county and have carefully avoided attempting these projects in any counties where the local veterinarians were not completely in agreement with the project. We think it is important that we do not take a customer away from the veterinarian but, just the opposite, to strengthen producer's appreciation for a preventive herd health program. Many services and supplies as is possible are provided without cost, especially during the first 3 years of a 5-year program. Economic impact is studied where possible, realizing the only control for comparison is any records available from years prior to the demonstration.

Selection of a cooperator is an extremely important part of this program. We have found the important characteristics are: (1) He be a cooperative person who is dedicated to maintaining a beef cattle enterprise; and (2) He must be receptive to changes and

willing to do his part to initiate new practices. Of course, we do not require he make all changes we suggest. However, we have lost 2 of the first 3 demonstrations we started. One, because the producer decided he did not have the time to further his inputs in his beef herd; and the other, simply because very few of the recommended changes ever got implemented. At least one of these individuals is no longer in the beef cattle business. Thus, we've made some mistakes and have been impressed with the importance of producer selection.

Other areas in which I feel we have erred concerns the tendency for us to make recommendations and, in some instances, do the actual work without getting the producer educated as to why and how. This mistake is easy to make in the interest of getting the job done as fast as possible.

We continue to supply many products to cooperators. Our initial plan was to do this for a 3-year period, then simply provide guidance the last 2 years of each 5-year demonstration. I now have reservations about this. We, as Extension specialists, have had little problem in getting industry to donate products for this purpose. However, I am beginning to believe these products should be supplied on a one-time basis. The producer's purchasing these products, including making the selection of which product he wants to use, can be a worthwhile part of his education. After the initial use of the "freebees", any further donated materials should perhaps be from a local source. This will develop greater involvement of local people.

The next concern area I have is, the length of individual demonstrations. I am not sure but that just as much can be accomplished in 3 years as in 5. This would allow new demonstrations to be set up in new counties.

The last, and perhaps the most important, area is that of how to get as much mileage as possible from the information developed in these demonstrations. We use much of the information in our day-to-day mass media educational efforts. Also, field days, both county and Statewide, are held on these farms when appropriate. However, many man-hours of time are spent in these demonstrations, and it is imperative we get as much as possible from these efforts. We have documented some of our progress on one farm on movie film, and we hope to add to this so in time we will have the complete story on film.

Another area that gives us some problem is in monitoring and documenting the economic impact of the changes we make. We do

require the cooperator to make his records on his beef enterprise available to us, and we have the aid of a farm management specialist. However, the impact of any one practice is difficult to assess, and about all we can hope to demonstrate is a change in the profit/loss column of the entire beef enterprise.

ooOoo

SETTING PRIORITIES FOR EDUCATIONAL PROGRAMS

The formal presentations during this conference have provided a thorough review of all facets of management related to reproduction. This was as complete and concise as has ever been presented in a single conference specifically related to reproductive management in beef cattle. These formal presentations have served as an excellent base for the remainder of the workshop.

The show-and-tell session and the information cafeteria have provided illustrations of Extension programs as an indication of what can be accomplished with emphasis on reproductive management by Extension. This was an interesting and very important part of the overall workshop.

The individual workshop sessions have provided opportunity for all attendees to participate in consideration of alternative programs and to identify education problems and opportunities.

In regard to the priorities presented by the workshop session chairmen, there haven't, in reality, been any new problems identified. However, through the workshop sessions, the age old problem of communicating with people (in this case primarily producers) has been identified as still being the primary challenge to Extension and to marketing segments of industry. It is emphasized that we simply need to develop better methods of communications and intensify our efforts to reach more people with the information that is available. One-on-one contact, such as "hands on" training and demonstrations are indicated to be important avenues of communications.

There is a strong feeling that there is seemingly considerable apathy among many producers. In many cases, producers are content with status-quo and are not motivated to seek available information and implement new practices.

Also, through the workshop sessions, it was pointed out that reproduction education programs can provide stimulus and serve as a vehicle for education regarding many other important areas because:

1. Reproduction is a multi-faceted function involving many aspects of production management; and

---

Presented by Bill Durfey, Executive Vice President, National Association of Animal Breeders, Box 1033, Columbia, MO, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

2. Reproductive performance is very important from the standpoint of economics.

It was also pointed out that if Extension involvement in education programs related to reproduction are to be successful, communication with and cooperation from the veterinary profession is critical. This is particularly true if pregnancy testing is to be taught through Extension programs. However, it is indicated that this is not an insurmountable problem as is well illustrated by the success of the Texas Extension program in reproduction.

It should also be noted that Extension reproduction programs that are successful in one State or area may or may not be successful in another State or area. However, it is apparent that there is ample opportunity for Extension to be creative in developing educational programs related to reproductive management. One such opportunity is to establish a means to determine what the current level of reproductive performance actually is. This should be done on an individual herd basis and overall on a State or national basis. This information, in turn, could be used to dramatically illustrate the potential economic return that could be realized from improvements in reproductive performance. This would also serve as a bench mark by which to objectively measure the success of our educational programs in reproduction.

It is also worthy to note that estrus synchronization--if products are ever approved by FDA--potentially is an "innovation" which will stimulate interest among many producers for new information related to reproduction. We hope that Extension is prepared when this does become a reality.

ooOoo

RESPOND TO THE CHALLENGE

I commend the National Extension-Industry Beef Resource Committee for recommending and arranging for this workshop. The attendance is impressive both in number and quality. A high percentage of the principle contributors to efficient reproductive management in this country are here.

Dr. A. L. Eller gave the objectives of this workshop as developing momentum and identifying new methods and materials which focus on priority concerns of Extension and industry in the area of reproductive management. He pointed out the vast number of factors that affect reproductive efficiency and the overall significance of management in dealing with all these factors systematically.

Dave Nichols drew an analogy between developing a winning football team and developing a productive cow herd. He emphasized that both were selected on the basis of performance, not appearance. He recommended tough standards, a short calving season, selection for birth weight to reduce dystocia, and culling cow-killing bulls and cows that cannot have a calf.

Larry Corah discussed nutrition in terms of economically weaning maximum pounds of calf/cow exposed to the bull. After stressing the significance of a short calving season, he discussed the function of various nutrients. He presented data on the importance of energy in preparing cows for calving and post-partum recycling. If any economizing is done on energy, it should be done during mid-gestation. When cows calve, nutrient requirements basically double. Also, consideration must be given to cow size, milk production, and weather. He reminded the audience that pasture is usually the most economical feed for a cow herd. Also, cows selectively graze and will select a higher quality diet than average nutritive value of a pasture. However, intake on poor quality pasture is only 1.5 percent of body weight compared to 2.5 percent on high quality pasture. Phosphorus is a critical nutrient and may need to be force fed. Potassium supplementation is being considered more than in the past.

Robert Bellows said that producers should expose 50 percent more heifers to the bull than they plan to keep for replacements. They should then pregnancy test and keep the early breeders, sell any additional bred heifers, and sell the open heifers as feeders or

---

Presented by O.D. Butler, Vice President for Agriculture & Renewable Resources, Texas A&M Univ, College Station, TX, at the National Extension-Industry Invitational Workshop on Beef Cattle Reproductive Management, Oklahoma City, OK, October 30-November 1, 1978.

feed them out. To get heifers bred at the proper time, heifers should be weighed; the daily gain required to reach the proper breeding weight at the desired breeding date should be calculated; and the heifers should then be fed a ration to reach the desired weight on the desired date.

Peter Chenoweth discussed the Society of Theriogenology breeding soundness evaluation, which included physical examination, scrotal circumference, and semen evaluation. He then discussed mating behavior and social interactions of bulls. He pointed out that socially-dominant bulls are not necessarily fertile and presented data showing a high correlation between bull fertility and early puberty in half-sib heifers. Dr. Chenoweth said that 20 percent of bulls are poor breeding risks and libido is not correlated with fertility. Testosterone blood level is not effective in diagnosing bull fertility. The best time to rank the breeding potential of bulls is as yearlings. Immobility of the cow is the greatest stimulus for bulls to serve.

Tom Bibb introduced the principle of the "4 P's" relative to health considerations for efficient reproductive management--Prior Planning Prevents Problems. He said with proper planning, herds only have to be gathered twice annually for effective immunization and parasite control. Adequate facilities and the need to educate producers to recognize their limitations were emphasized for an effective health program. Pregnancy testing was presented as a necessity, and maintaining a supply of frozen colostrum was highly recommended.

Ray Woodward discussed the need to select for reproductive traits. He emphasized the advantages of crossbreeding in reproductive efficiency. He then issued a warning relative to correlated responses that might be undesirable; e.g., age of puberty increasing with growth rate. He gave the example of the Tarentaise breed cancelling the certificate of registration on any cow that doesn't calve by 30 months of age as being something all breed associations should consider if they are serious about improving reproduction.

Clif Marshall emphasized the need for joint planning and cooperation among those involved in assisting producers synchronize estrus in their cow herd. Extension, veterinarians, pharmaceutical company representatives, and producers must cooperatively develop a system to insure success in estrus synchronization. He also emphasized the need to know the cycling status of the cow herd before using synchronizing products and being sure that an adequate number of inseminators were available to service the herd when these products are withdrawn. The technique of "shanging" calves to increase

conception rate was discussed. The need to educate producers on how synchronization products work and the pregnancy rates they can expect were presented as necessities in successful synchronization programs.

James Sokolowski discussed Upjohn's approach to estrus synchronization using Lutalyse. Upjohn expects FDA approval of this product as a veterinary prescription drug for estrus synchronization in 1979. Sokolowski said that if Lutalyse is properly used, a producer can achieve pregnancy rate equivalent to natural service. He emphasized that education was essential for effective use of this product and that Upjohn furnishes educational materials for this purpose.

Ron Long discussed Syncro-Mate-B and the approach Curtiss planned to use in merchandising this product for estrus synchronization. Curtiss expects FDA approval of this product to be sold as an over-the-counter drug in 1979. Long emphasized that education was essential for the successful use of this product. He said customer satisfaction would depend on establishing realistic goals, using a quality AI program, making sure females were cycling and eligible for breeding, and proper desire and attitude on the part of producers. He recommended the "shanging" of calves to increase conception rate. Also, rather than get involved in an extensive heat detection program, Long recommended insemination of all cows at a designated time following withdrawal of Syncro-Mate-B. He gave the advantages of using this product in conjunction with AI as being able to use superior genetic material, crossbreeding, less bulls needed, heat detection not necessary, labor saving, and uniform calf crop.

Dennis Copeland discussed Estrumate and the approach ICI planned to use in marketing this product. The criteria for successful use of Estrumate were similar to Lutalyse and Syncro-Mate-B. Emphasis was placed on a management program that would insure females were eligible for service when the product was withdrawn. Copeland presented data on 3 programs that emphasized the value of palpation. He said that Estrumate could also be used to abort feedlot heifers. He suggested that the term "estrus synchronization" should be changed to "ovulation synchronization." Cost data of $16 per cow for drug and semen were used. However, it was recognized that semen prices varied depending on bull used.

A short discussion period followed the presentations by Sokolowski, Long, and Copeland. Concerns were expressed relative to FDA approval of estrus synchronization products and the cost of the products if they were approved. If these drugs are approved by FDA,

it would be considered a major opportunity for industry and Extension to cooperate in the best interest of beef producers.

Tom Price presented the ABS Herd Management System. This computerized system offered by ABS provides management with information for improving reproductive efficiency. The Triple 6 Ranch in Colorado and Morris Farms in Illinois were used as successful examples making application of this system. The key elements of the system were inventorying the situation and exercising decisionmaking control over the system based on monitoring a predicted cycling pattern.

Ray Hinders discussed precise and economical feed supplements based on least-cost formulation.

Dale Engler discussed Ramsey Ranch herd reproduction records. He emphasized the necessity of identification, strict management, and records. He uses a computerized system which provides detailed information for selection. Presently, the Ramsey Ranch runs 1,000 cows and 400 heifers. They have been keeping records on their cow herd since 1954 and have been performance testing since 1956. They use MGA to synchronize estrus and have found it to be economical and effective. They induce calving on their Maine-Anjou's if they haven't calved by 280 days. Engler said there was still a lot to be learned about beef cow reproductive management, especially in the area of precise nutritional requirements.

Robert Totusek who moderated Session II of the workshop made a summary statement emphasizing the need to maximize producer returns. He contended there are times when producers can't afford to maximize percent calf crop.

John Beverly gave an overview of the Texas Extension Reproduction Program. This program has operated very successfully for more than 10 years. The program is built around reproduction short courses where palpation, bull evaluation, and AI are taught. Whitney Rounds presented information on teaching palpation, and John Spitzer discussed bull evaluation. Texas Extension specialists conducted 38 Extension-Industry Reproduction Short Courses in 1978. Most of the participants at these short courses do not make direct use of the techniques taught, but 70 percent incorporate the practices taught into their management systems through trained professionals.

J.D. Mankin discussed reproductive management in terms of what producers should do, can do, will do, and won't do. The focal point of Idaho's reproduction management program was providing management information; i.e., calving interval and length of calving season through their BCI program. He emphasized pinpointing

problems and establishing bench marks so progress could be measured in correcting the problems. He presented a county program for shortening calving season including: (1) establishing bench marks, (2) developing a handbook containing supportive educational materials, and (3) a plan of action for implementing the program. The concept of using para-professionals in total cow herd management result demonstrations was presented.

Ron Parker discussed the Kentucky Extension Service reproductive management educational program and survey information on programs in several other States. He emphasized that educational programs to help part-time and small producers in this area were very difficult. Cattle handling facilities are generally inadequate; they don't seasonally breed; pasture management is usually fair to poor; etc. Kentucky Extension has implemented 2 result demonstrations, and more are planned to demonstrate all the procedures involved in efficient reproductive management. Kentucky has also developed some Caramate material which can be utilized by county agents and in tele-lectures. These are about 15- to 25-minute programs that utilize lots of slides. Parker drew attention to a system Oklahoma was using in conducting pregnancy testing schools where each participant furnished 5 cows for use in teaching the school.

NOTATION: Dr. Butler did not cover Work Group reports in his summary.

ooOoo

PROPOSED Memorandum of Agreement

Following summation of the various symposium papers, Dr. O. D. Butler emphasized the need for continued national effort to improve reproductive management. He encouraged every State represented to develop a joint Industry-Extension reproduction educational program to more effectively utilize the total resource base for helping producers improve beef cattle reproduction. He emphasized the need for action programs to implement the available knowledge revealed through this workshop and the need for continued research to expand the knowledge base. In visiting with workshop participants and based upon previous experience, Dr. Butler discerned a need for a memorandum of agreement between Extension and the veterinary profession relative to how they could best work together in the area of reproductive management. He volunteered Dr. John Beverly to prepare an article, co-authored by a Texas bovine practitioner, for publication in the AVMA Journal giving facts on the impact of the Texas Extension reproduction educational program on local practitioners. This article hopefully would provide a basis for future discussions between the American Association of Bovine Practitioners and Extension relative to cooperation in educating producers in the area of reproduction. Dr. Butler said he didn't think it was possible to legislate ignorance.

He then referred to the Coleman County Herd Health Records as a good cooperative publication between a county Extension agent and a local practitioner.

Dr. Butler then recommended that a committee be established from participants of the workshop to initiate discussions with the American Association of Bovine Practitioners relative to developing methods and procedures for closer working relations with Extension in the area of reproductive management. He then accepted nominations for this committee. Those selected to serve on the committee were:

Dr. Ben Norman
Extension Veterinarian
University of California
Davis, CA 95616

Dr. Earl L. Drake
Extension Veterinarian
University of Nevada
Reno, NV 89507

Dr. A. L. (Ike) Eller, Jr.
Extension Animal Scientist
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061

Dr. Randall Reed
Extension Animal Scientist
Ohio State University
2029 Fyffe Road
Columbus, OH 43210

Dr. John Beverly
Extension Animal Scientist
Texas A&M University
College Station, TX 77843

Dr. Wallace Larson
(AABP)
203 East Rhapsody
San Antonio, TX 78216

Dr. Dixon D. Hubbard
Animal Scientist
USDA, SEA-Extension
Room 5051-South Bldg
Washington, DC 20250

This committee was then requested to contact Dr. James J. Jarrett, President of AABP (Rome, Georgia), or Vernon Tharp, Past President of AABP (Ohio State University), relative to initiating dialogue with American Association of Bovine Practitioners.

NOTATION: The establishment of this committee was discussed with Dr. Bill Taggart, Workshop Administrative Advisor for ECOP. He said the committee would have to be approved by ECOP before it could represent Extension. This process would take several months, and he was not very optimistic that the committee would be approved. He was not opposed to informal dialogue with AABP on the part of the committee, but he thought such dialogue would be more effective at the State level.

The support of State Extension Directors would be necessary before Extension could effectively communicate with the American Association of Bovine Practitioners on a national level. Thus, the only action presently being taken is, the Texas Extension reproduction educational program is being analyzed relative to its impact on local practitioners. This information will be communicated to AABP. If additional dialogue is mutually considered to be justified, a meeting can then be arranged between the informal committee and representatives of AABP to discuss procedures for joint AABP and Extension cooperation.

ooOoo

WORK GROUP REPORT #1

Chairman : A. L. Eller, Jr.
Secretary: K. O. Zoellner

Problem: Pounds of calf weaned per cow bred too low for profit return.

Opportunities: County programs of awareness and action must be developed through State programs and continued efforts on national programs.

Problem Nature:

1. Lack of Awareness (Apathy) of Producers, Industry, Research, Extension, and Feed Industry

    a. Part-time producers
    b. Need facts (status)
    c. Low returns

2. Inadequate Nutrition of Cow Herd

    a. Energy
    b. Protein
    c. Minerals

3. Health

    a. Lack of preventive medicine
    b. Lack of health programs
    c. Fertility check and physicals on bulls
    d. Pregnancy checking and culling females

4. Low Percent Calf Crop on 1st and 2nd Calf Cows

    a. Lack of Nutrition
    b. Lack of Sorting for Nutritional Need
    c. Dystocia
    d. Birth weights too heavy
    e. Heifers bred too young and/or too light

5. Too Few Producers Have Set Calving Season and Too Long Herd Calving Interval

    a. Apathy
    b. Lack lots or pastures for bulls

6. Genetic

   a. Genetic and environmental interaction -- cow size and feed resources not coordinated

   b. Lack of superior genetic material due to lack of selection within purebred industry

   c. Failure to use systematic crossbreeding programs

7. Calf Livability (Estimated To Be Approximately Half of Calf Loss)

   a. Diseases
   b. Predators

8. AI and Synchronization lack of knowledge of how to do.

ooOoo

Problem Area	Disciplines & Industries Involved: Ext & Univ	AI Ind	Breed Assn	Pharma & Feed Co	Vet	Natl Organ	Methods: Who	What
1. Awareness	1[a/]	1	1	1	1	1	Extension All All	- Status of reproduction within State. - Conferences. - Publicity.
2. Nutrition	1	3	3	2	2	3	Ext & Univ	- Develop educational materials & training; Research needed on nutrient requirements (energy, protein, & minerals); & Feed & Forage Quality for maximum reproductive performance.
3. Health	1	2	3	2	1	3	Feed Ind Veterinarian All	- Greater knowledge & communication with clients. - Greater knowledge & communication with clients. - Publicity & attention.
4. Managing 1st & 2nd Calf Cows	1	2	3	2	1	3	Univ & Ext	- Conduct research & develop programs on how to best sort & manage by condition, age, size, & production potential.
5. Calving Season & Interval	1	1	1	3	2	1	All	- Matching calving to biology & forage to maximize profits.
6. Genetics	1	1	1	3	2	2	Ext, Breed Assn, AI & Natl Organ Ext & Univ Breed Assn	- Identification of animals & use of records. - Research need with subsequent development of educational material on matching breeds & breeding systems to feed resources. - Include all breeding age females in breeding herd inventory & report results to producer.
7. Calf Livability	1	2	2	3	1	3	Ext & Vet	- Improvement of management--health & nutrition.
8. AI Usage	2	1	1	3	3	3	AI Industry, Pharma Co, Vet, Breed Assn, & Ext	- Education on use & application of ovulation synchronization.

[a/] Degree of Emphasis.

WORK GROUP REPORT #2

Chairman : John Beverly
Secretary: Ed Duren

Committee members segregated problems into 2 major categories: (1) People Action, and (2) Cattle Management.

In the "People" category, 4 priority areas were defined with considerations for implementation in each priority.

In the "Cattle Management" category, the committee labeled all areas of management as important, but stressed the importance of beef cattle program building committees to identify appropriate State and county problems with program emphasis. These opportunities were classified by area.

Due to overlap of program opportunities, it would suggest a total program effort of planning and action supported by modern audio-visual information aimed at the "hands-on" approach: a re-emphasis to meaningful demonstrations which will generate appropriate data and practical methods that can be extended by volunteer resource people both on professional and para-professional levels.

People Problems and Opportunities

To increase the early and rapid adoption of production and management skills, based upon accepted scientific knowledge, by the cow-calf producer.

Priorities:

1. Educational methods and delivery systems

    a. Mass communications
    b. Wet labs
    c. "Hands-on" approach
    d. One-on-one relationships
    e. Initiate action programs based on recommendations of county beef cattle program building committees
    f. Simplicity of technology

2. Production motivation relative to needs

    a. Economics - Primary or secondary income
    b. Recreation and/or prestige
    c. Part-time, small, or low income
    d. Involvement and commitment to action
    e. Exten-search, field studies, and projects

3. Goal orientation

    a. Need to re-define the production of food and fiber
    b. Establish a measurement of success
    c. Identification of audience

4. Efficiency of information distribution

    a. Role/use of para-professional/volunteers
    b. Application of audio-visuals
    c. Staff training and involvement
    d. Demonstration units (ranches or farms)
    e. Unity of recommendations

Cattle Problems and Opportunities

To identify regional, State, county, or community beef production problems and establish programs relative to reproductive efficiency with specific educational emphasis.

To establish bench marks for reasonable and appropriate measurement of program effectiveness.

1. Cow Programs

    a. Widespread adoption of pregnancy examinations as basis of management decisions
    b. Positive cow identification
    c. Limited and controlled breeding season
    d. Shortening the calving period relative to environmental season
    e. Develop cows most suitable to environment and/or appropriate crossbreeding systems

2. Bull Programs

    a. Emphasis on genetic improvement and selection
    b. Physical and fertility evaluation programs
    c. Role of AI and importance of semen quality

3. Replacement Heifers

    a. Selection and development to reach puberty at the proper time
    b. Techniques for calving 2-year-olds
    c. Emphasis on decreasing the number of light weight, undeveloped heifers
    d. Nutrition and management of 2-year-olds for nursing and re-breeding to calve as 3-year-olds

4. Stocker Cattle

   a. Development of stock cattle programs
   b. Improved weaning management
   c. Marketing alternatives to improve dollar return

5. Management

   a. Explore marketing alternatives
   b. Financial impact of management systems
   c. Management and production correlated with available resources, specifically forage supply

ooOoo

WORK GROUP REPORT #3

Chairman : Curtis Absher
Secretary: Jim Gosey

The discussion was initiated by asking each participant to indicate the problem or problem area they felt deserved highest priority. Subsequent discussion led to these problems being ranked in the following order of priority:

1. Motivating producers for change and to use presently available information.

2. Short, defined calving season.

3. Nutritional management

   a. Nutrition of first-calf heifers.
   b. Cost of developing replacements.
   c. Management to reduce post-partum intervals.

4. Implementation of estrous synchronization programs.

5. Calving difficulty.

6. Estrous detection.

7. Excessive use of visual indicators of reproductive efficiency.

Some of the comments concerning the above problems were:

1. Need to define the most economical calving season for each operation by consideration of weather conditions, available forage, and labor resources.

2. The optimum calving season may be 60 days for some producers but 90 days for others.

3. Perhaps we should be working toward getting 80-85 percent of cows calved in the first 45 days of calving in addition to defining the length of the calving season.

4. Perhaps we should direct our efforts at reducing the post-partum interval in addition to concentrating on the length of the calving season.

5. We need to back up our discussions of reproductive management with economic data to demonstrate the dollar advantage of implementing the management practices we talk about.

6. May need to suggest producers develop an alternate plan for targeting their calving season when bad weather or other emergency conditions arise.

7. Reproductive data needs to be emphasized in our standard performance record programs.

8. Should concentrate on starting heifers on a planned nutrition program to allow calving in a short season for the first calf. Nutritional neglect prior to 3 years of age and especially between 18-24 months is very costly in terms of re-breeding performance and lifetime reproductive performance.

9. Extension should use more information which has been developed by industry.

10. Need to develop more joint Extension-Industry approaches to educational programs.

11. Extension may need to develop more result demonstration herds to assist in the acceptance of recommended management practices to improve reproductive performance.

As a result of the above discussion, the following were identified as key problem areas:

1. Motivation of producers to use information currently available.

2. Need to define or optimize the calving season.

The following specific ideas were suggested as methods of action to begin solving the above problems:

1. Co-sharing of personnel lists between Extension and industry.

2. Co-sponsorship (between Extension and Industry) of continuing education programs for practicing veterinarians.

3. Extension should take advantage of the advent of estrous synchronization programs to develop lines of communication with practicing veterinarians.

WORK GROUP REPORT #4

Co-Chairmen: Daryl Strohbehn
Larry Corah
Secretary : Ron Parker

Participants were asked to list problems they felt were important as affecting beef cattle reproduction. The following is a summary of these responses, and the number of times each was listed:

Nutrition	5
Low percent of calf crop	5
Long calving seasons	4
Small producers	3
Poor use of reproductive information	3
Poor management of heifers	2
Lack of identification systems	2
Too few pounds of calf/cow	1

Much discussion followed concerning the problems of low reproductive efficiency in beef herds. A common problem which was repeatedly referred to was, awareness by the producer of where he really stands concerning reproductive efficiency, and perhaps of truly understanding what reproductive efficiency really is.

There was much discussion concerning the role of the small producer, the amount of emphasis Extension should place on the producer with small herds (15 cows or less), and the percent of producers who depend on beef cattle for a high percent of their income. It was generally felt that if the "small" cattleman is ignored, a high percent of producers would be involved.

It was suggested the price/profit picture of recent years had forced many producers into poor management; but even in those years, the identification of the poor-producing cow was just as important. Thus, the need to identify and cull open cows was stressed.

The consensus seemed to be that poor reproductive efficiency was due to poor management, long calving seasons, and poor nutrition. It was also suggested that low nutrition may be the cause of the other problems, such as strung out calving seasons.

An attempt was made by the group to consolidate the above list of problems into more comprehensive problem categories as follows:

1. Awareness of the economic impact of reproductive efficiency.

2. The need for an inventory of the reproductive status at the herd level.

3. Forage, range, and nutritional programs as influencing reproduction.

The next question the group tackled was, how to implement effective educational programs to combat the problems previously discussed? There was agreement that the problems should be tackled on two levels--the national level and the local level.

National Level

1. Extension programs as now implemented will continue. At the local level priority will be given to areas stressed as important by the administration. Administrators at all levels, down to the area director, need to emphasize the importance of reproductive efficiency. Programs will be easier to implement and administer at the local level if the blessings of the administration are known.

2. Many sources of educational materials exist, in industry and Extension alike. The group suggested the need for a national listing service giving available materials and names of persons or agencies to contact for these materials.

3. One of the large problems we face is to reach those producers who have not been reached by the educational media (Extension and industry). It was suggested that most farm news broadcasters, having rather lengthy programs, would jump at the chance to use short (2-3 minute) audio-video tapes. These tapes would, of necessity, be designed to attract attention to one quick point.

4. Support of the forthcoming beef referendum was expressed.

5. The point was emphasized that this meeting was, in itself, newsworthy as an indication of the importance placed upon reproduction by the entire industry.

Local Level

1. The need for continued, and perhaps renewed, emphasis on a close working relationship between industry and Extension was voiced. It was suggested that such groups as the American Feed Manufacturers Assn, if made aware of areas being emphasized by Extension, would also give these areas emphasis at the local

level. Also, the Agriculture Bankers Assn was mentioned as a group seeking ways of helping the producer and having methods which put them in contact with many producers.

2. The value of local demonstrations as attention-getting educational tools was repeatedly mentioned.

ooOoo

REGISTRANTS

NATIONAL EXTENSION-INDUSTRY INVITATIONAL WORKSHOP ON BEEF CATTLE REPRODUCTIVE MANAGEMENT
October 30-November 1, 1978

Curtis Absher
Extension Animal Scientist
University of Kentucky
Lexington, KY 40506

Carl Alexander
Cargill, Inc.
Cargill Office Center
Box 9300
Minneapolis, MN 55440

Wayne Anderson
819 N Shore Road
Hot Springs, AR 71901

Ken Apple
Area Extension Livestock Agent
Oklahoma State University
Room 113 - Courthouse
Duncan, OK 73533

James Archie
Southern University
Baton Rouge, LA 70813

Steve Armbruster
Extension Animal Scientist
Oklahoma State University
Stillwater, OK 74074

Bill Arnold
5800 Foxridge Drive
Mission, KS 66202

Kent C. Barnes
Area Extension Livestock Agent
Oklahoma State University
Courthouse
McAlester, OK 74501

Randall R. Bartling
Area Extension Livestock Agent
Oklahoma State University
Box 320
Guymon, OK 73942

Frank E. Bates
Area Extension Livestock Agent
Oklahoma State University
1700 N Broadway
Ada, OK 74820

Wm. C. Behrens
Extension Animal Scientist
University of Nevada
Reno, NV 89507

Harold Bennett
Breeding Programs Manager
Central Ohio Breeding Assn
1224 Alton Darby Road
Columbus, OH 43228

Sherman Berg
American Shorthorn Assn
8288 Hascall Street
Omaha, NE 68124

John Beverly
Extension Animal Scientist
Dept of Animal Science
Texas A&M University
College Station, TX 77843

Joseph W. Bitter, D.V.M.
Route 1, Box 5B
Edna, TX 77957

Roger Brownson
Extension Beef Cattle Specialist
Montana State University
Bozeman, MT 59715

Bob Brubacher
3655 Forest Road
East Lansing, MI 48823

Michael C. Brumm
Oklahoma State University
1500 N Kickapoo
Shawnee, OK 74801

Peter Burfening
Dept of Animal Science
Montana State University
Bozeman, MT 59715

O. D. Butler
Vice President for Agriculture
and Renewable Resources
Texas A&M University
College Station, TX 77843

Larry Cannon
Vice President
Oklahoma Cattlemen's Assn
Blackwell, OK 74631

L. H. Carroll, D.V.M.
Elanco Research Lab
Dallas, TX 75221

Emmett Carter
Executive Secretary
American Pinzgauer Assn
P.O. Box 1003
Norman, OK 73070

Bill Clay, D.V.M.
The Upjohn Company
1723 Crescent
Stillwater, OK 74074

M. K. Cook
Extension Animal Scientist
University of Georgia
Athens, GA 30602

Dennis D. Copeland
2525 Blackwood Road
Wilmington, DE 19810

Larry Corah
Extension Animal Scientist
Kansas State University
Manhattan, KS 66506

Wes Cupp
Ranch Manager - Kerr Foundation
Route 1
Poteau, OK 74953

Gene H. Deutscher
University of Nebraska
P.O. Box 429
North Platte, NE 69101

H. H. Dickenson
Executive Vice President
American Hereford Assn
715 Hereford Drive - Box 4059
Kansas City, MO 64101

Zack Dismukes
East Prairie, MO 63845

Nancy Diuble
105 Charter Oaks
Louisville, KY 40222

Jack Downey
Route 2, Box 54
Perkins, OK 74059

Earl L. Drake
Extension Veterinarian
University of Nevada
5305 Mill Street
Reno, NV 89501

Ed P. Duren
Extension Animal Scientist
University of Idaho
Box 29
Soda Springs, ID 83276

Bill Durfey
Executive Vice President
National Assn of Animal Breeders
P.O. Box 1033
Columbia, MO 65205

A. L. Eller, Jr.
Extension Animal Scientist
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061

Ken Ellis
Extension Animal Scientist
University of California
Davis, CA 65616

Peter Elsden
Animal Reproduction Lab
Colorado State University
Fort Collins, CO 80521

Dale Engler
Ramsey Ranch
Box 1273
El Dorado, KS 67042

Sid Ercanbrack
Extension Agent
Route 3, Box 124
Enid, OK 73701

William E. Erickson
General Manager
Central Ohio Breeders Assn
1224 Alton-Darby Road
Columbus, OH 43228

Glen Erpenbach
P.O. Box 500
New Prague, MN 56071

Robert C. Fincham
Route 1
Ames, IA 50010

Larry Foster
Extension Animal Scientist
New Mexico State University
Box 3AE
Las Cruces, NM 88003

D. E. Franke
Dept of Animal Science
Louisiana State University
Baton Rouge, LA 70803

W. Dean Frischknecht
Extension Animal Scientist
Oregon State University
Corvallis, OR 97331

Max Fulscher
Amherst, CO 80721

Henry C. Gardiner
Ashland, KS 67831

Warren Garrett
1048 County Club Drive
Seguin, TX 78155

John Gerken
Extension Animal Scientist
Virginia Polytechnic Institute
and State University
Blacksburg, VA 24061

Robert A. Godke
Dept of Animal Science
Louisiana State University
Baton Rouge, LA 70803

Mark Goodrich
New Richmond, WI 54017

Jim Gosey
Extension Beef Cattle Specialist
209 Baker Hall
University of Nebraska
Lincoln, NE 68583

G. Ashby Green, D.V.M., Leader
Extension Veterinary Medicine
Mississippi State University
P.O. Box 5425
Mississippi State, MS 39762

William Green
Cattle Systems Supply
Farmer Hybrid Company
Box 538
Warner, OK 74469

Rick Hardin
ICI Americas
Wilmington, DE 19894

Burke Healey
Flying L Ranch
Davis, OK 73030

Ray Hinders
Producers Grain Corp
P.O. Box 32110
Amarillo, TX 79120

James Hixon
367 Veterinary Medicine
University of Illinois
Urbana, IL 61803

Dixon D. Hubbard
Program Leader-Animal Science
USDA, SEA-Extension
Room 5525-South Bldg
Washington, DC 20250

Don Hudman
Director, Ag Division
Kerr Foundation
P.O. Box 588
Poteau, OK 74953

Joe Hughes
Extension Animal Scientist
Oklahoma State University
Stillwater, OK 74074

Don Hutzel
NOBA, Inc.
P.O. Box 607
Tiffin, OH 44883

David Ibsen
Extension Veterinarian
University of Arkansas
P.O. Box 391
Little Rock, AR 72203

Shann Ingram
Noble Foundation
Route 1
Ardmore, OK 73401

William P. Jackson (NAAB)
1401 College Avenue
Manhattan, KS 66502

Cleon Kimberling
Extension Veterinarian
32A Vet Medicine Bldg
Colorado State University
Fort Collins, CO 80523

M. A. Kirkeide
Extension Animal Scientist
Hultz Hall
North Dakota State University
Fargo, ND 58105

David Kirkpatrick
Extension Animal Scientist
University of Tennessee
P.O. Box 1071
Knoxville, TN 37901

Earl W. Klosterman
Ohio Agricultural Research
& Development Center
Wooster, OH 44691

L. M. Koger
Route 2, Box 20
Pullman, WA 99163

Paul A. Kunkel
Select Sires, Inc.
11740 U.S. 42
Plain City, OH 43064

Al Lane
Extension Animal Scientist
University of Arizona
Tucson, AZ 85721

Wallace R. Larson, D.V.M. (AABP)
203 East Rhapsody
San Antonio, TX 78216

Art C. Linton
Extension Beef Cattle Specialist
211a Animal Science Bldg
Colorado State University
Fort Collins, CO 80521

Ron Long
Curtiss Breeding Service
Cary, IL 60013

Craig Ludwig
American Hereford Association
715 Hereford Drive
P.O. Box 4059
Kansas City, MO 64101

J. D. Mankin
Extension Animal Scientist
Research & Extension Center
Route 8, Box 8478
Caldwell, ID 83605

John Marienan
ICI Americas
Wilmington, DE 19897

Clifton E. Marshall
Select Sires, Inc.
11740 U.S. 42
Plain City, OH 43064

William E. Maxson, D.V.M.
Allied Mills
Libertyville, IL 60048

James M. Mayes
District Representative
Midwest Breeders Cooperative
Springfield, MO 65706

John McCormack
Route 3, Box 269B
Athens, GA 30605

Robert L. McGuire, Chairman
Extension Animal Science
Auburn University
Auburn, AL 36830

Charles A. McPeake
Extension Animal Scientist
801 San Francisco Street
Rapid City, SD 57701

Bill McReynolds
Extension Animal Scientist
121 Clark Hall
Washington State University
Pullman, WA 99164

Duane McVey
Extension Center
Oklahoma State University
Stillwater, OK 74074

Duane Miksch
Extension Veterinarian
University of Kentucky
P.O. Box 469
Princeton, KY 42445

Edward Moody
Dept of Animal Science
Montana State University
Bozeman, MT 59715

Kenneth Moore
2135 Edgehill Road
Salina, KS 67401

James M. Moss
Extension Animal Scientist
University of Arkansas
P.O. Box 391
Little Rock, AR 72203

Don Nelson
Box 297
Danville, IA 52623

Charles Nichols
Arnett, OK 73832

Ben B. Norman
Extension Veterinarian
405 Surge IV
University of California
Davis, CA 95616

George W. Norwood
1408 Melody Lane
Pawhuska, OK 74056

T. W. Orwig
Extension Animal Scientist
4203 Quivira Drive
Hutchinson, KS 67501

Fayne H. Oberst, D.V.M., Head
Dept of Med & Large Animals
Oklahoma State University
Stillwater, OK 74074

Ron Parker
Extension Animal Scientist
University of Kentucky
P.O. Box 469
Princeton, KY 42445

James Patterson
Extension Animal Scientist
North Carolina State University
P.O. Box 5127
Raleigh, NC 27650

Ken Persyn
Medina Valley A.I. Lab
P.O. Box 535
Castroville, TX 78009

John B. Peters
Extension Animal Scientist
6026 Ag Science Bldg
West Virginia University
Morgantown, WV 26506

Arnold Peterson
Searle Agriculture
Box B-2
Elburn, IL 60119

Ron Pickard
Extension Veterinarian
256 Large Animal Clinic
University of Illinois
Urbana, IL 61801

James W. Pirie, D.V.M.
President
Pan American Breeders
Route 2, Box 453-A
Terrell, TX 75160

Pat Poage
National Assn of Animal Breeders
P.O. Box 1033
Columbia, MO 65201

Tom Price
Beef Manager, Systems
American Breeders Service
Route1
DeForest, WI 53532

John Race
P.O. Box 71
Springfield, MO 65801

R. D. Randel
Extension Animal Scientist
Texas A&M University
Drawer E
Overton, TX 75684

Randall R. Reed
Extension Beef Cattle Specialist
Ohio State University
2029 Fyffe Road
Columbus, OH 43210

L. E. Rice
Associate Professor
College of Veterinary Medicine
Oklahoma State University
Stillwater, OK 74074

T. D. Rich
Extension Beef Cattle Specialist
004 Animal Husbandry
Oklahoma State University
Stillwater, OK 74074

Jim Ross
Extension Beef Cattle Specialist
130 Mumford Hall
University of Missouri-Columbia
Columbia, MO 65211

Whitney Rounds
Extension Livestock Specialist
Texas A&M University
Box 2159
Vernon, TX 76384

Robert S. Sand
Extension Animal Scientist
402 Rolfs Hall
University of Florida
Gainesville, FL 32611

R. D. Scarth, Director
Education and Research
American Polled Hereford Assn
4700 East 63rd Street
Kansas City, MO 64130

C. O. Schoonover
Extension Animal Scientist
University of Wyoming
Box 3354, University Station
Laramie, WY 82071

Gene Schroeder
Palisade, NE 69040

Frank L. Schwartz
Extension Animal Scientist
N.W. Area Extension Office-KSU
170 West 4th Street
Colby, KS 67701

Melford L. Scott
Area Extension Animal Scientist
Oklahoma State University
125 West Main
Cordell, OK 73632

Alan Sears
American Shorthorn Assn
8288 Hascall Street
Omaha, NE 68124

H. L. Self, Professor
Dept of Animal Science
Room 20, Curtiss Hall
Iowa State University
Ames, IA 50010

Glenn Selk
Area Extension Animal Scientist
Oklahoma State University
1750 North Sioux - Room A
Claremore, OK 74017

Bob Sheehan
Sire Analyst
Minnesota Valley Breeders
Box 500
New Prague, MN 56071

R. David Smith
130 Morrison
Cornell University
Ithaca, NY 14853

J. H. Sokolowski
The Upjohn Company
Kalamazoo, MI 49001

Dick Spader
Director of Performance Programs
American Angus Assn
3201 Frederick Boulevard
St. Joseph, MO 64501

John C. Spitzer
Extension Livestock Specialist
Texas A&M University
301 North Main Street
Bryan, TX 77801

Vernon Stevens
Extension Animal Scientist
Oklahoma State University
P.O. Box 1229
Enid, OK 73701

Paul Stratton
Box 3432
Laramie, WY 82071

Daryl R. Strohbehn
Extension Animal Scientist
109 Kildee Hall
Iowa State University
Ames, IA 50011

Orville Sweet
President
American Polled Hereford Assn
4700 East 63rd Street
Kansas City, MO 64130

W. M. Swoope
Extension Livestock Specialist
Mississippi State University
P.O. Box 5425
Mississippi State, MS 39762

Leif H. Thompson
Extension Animal Scientist
University of Illinois
Urbana, IL 61801

Jimmie Travis
COBA
Route 2, Box 363-A
Tyler, TX 75704

E. J. Turman
Dept of Animal Sciences & Industry
Oklahoma State University
Stillwater, OK 74074

L. C. Ulberg, Professor
Dept of Animal Science
231 Polk Hall
North Carolina State Univ
Raleigh, NC 27650

Keith Vander Velde
Livestock Specialist
Tri-State Breeders
Westby, WI 54667

Dick Vatthauer
Extension Livestock Specialist
University of Wisconsin
1675 Observatory Drive
Madison, WI 54667

Roy A. Wallace
Chairman, Beef Programs
Select Sires, Inc.
11740 U.S. 42
Plain City, OH 43064

Bob Watkins
MABC
East Lansing, MI 48824

Henry W. Webster
Extension Animal Scientist
P.O. Box 352
Edenton, NC 27932

Michael D. Whitacre, D.V.M.
Dept of Animal Science
North Carolina State University
Box 5127 (105 Polk Hall)
Raleigh, NC 27650

Richard L. Willham
Dept of Animal Science
Iowa State University
Ames, IA 50011

John N. Williams, II
Extension Animal Scientist
144 P&AS Bldg
Clemson University
Clemson, SC 29631

George Yott
Route 4, Box 869
McAlester, OK 74501

Ken Young
American Breeders Service
DeForest, WI 53532

Keith O. Zoellner
Extension Animal Scientist
Kansas State University
Manhattan, KS 66502

ooOoo